THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXIV. No. 2116.] LONDON, DECEMBER 1, 1903. [55TH YEAR. PRICE 6d.

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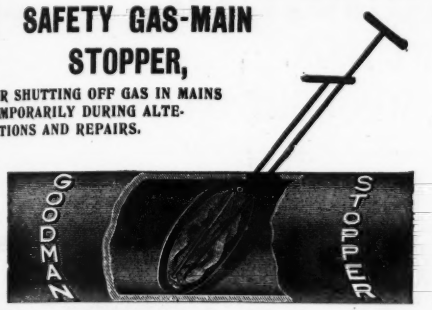

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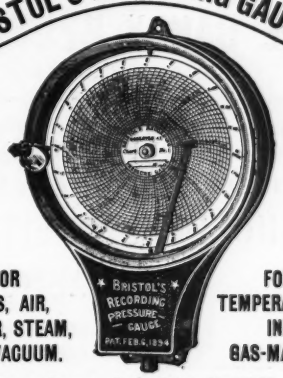

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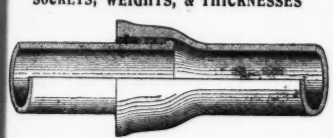

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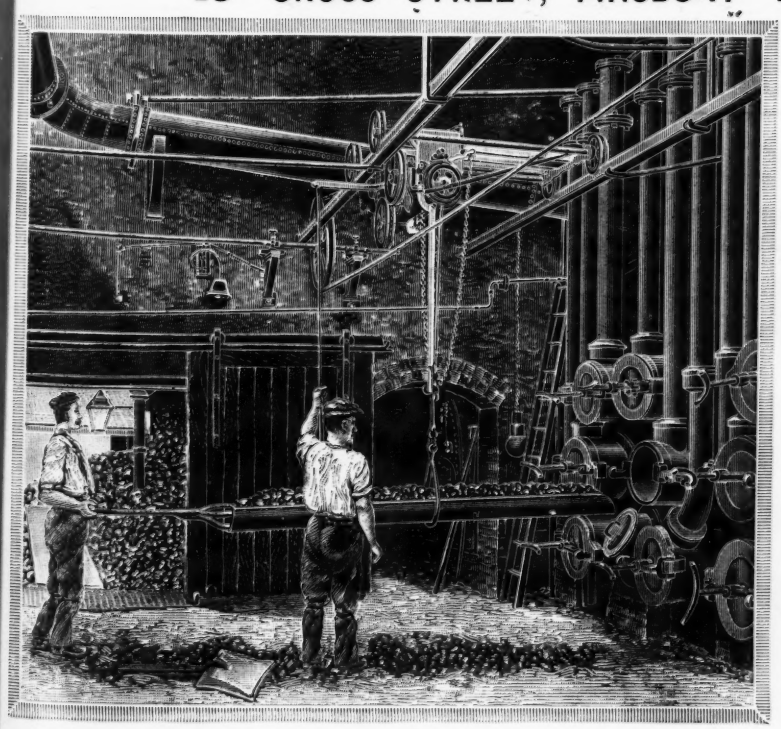

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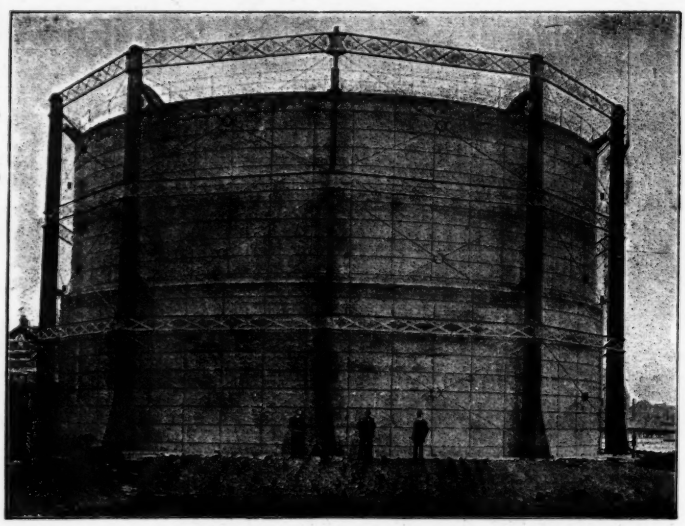

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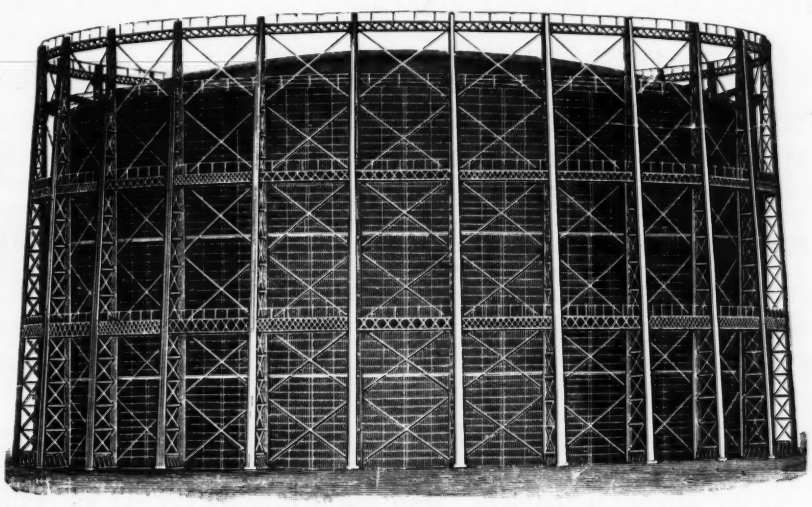

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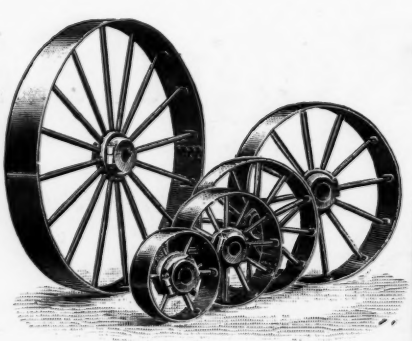

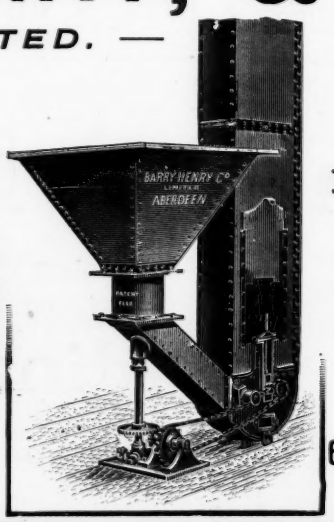

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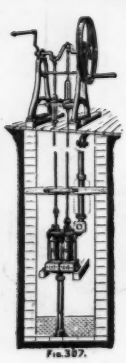

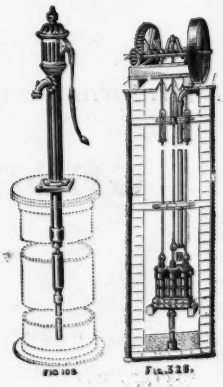

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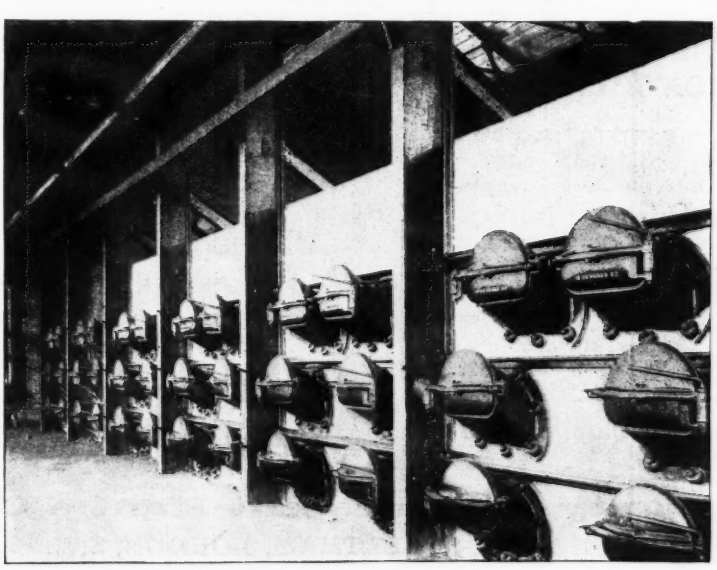

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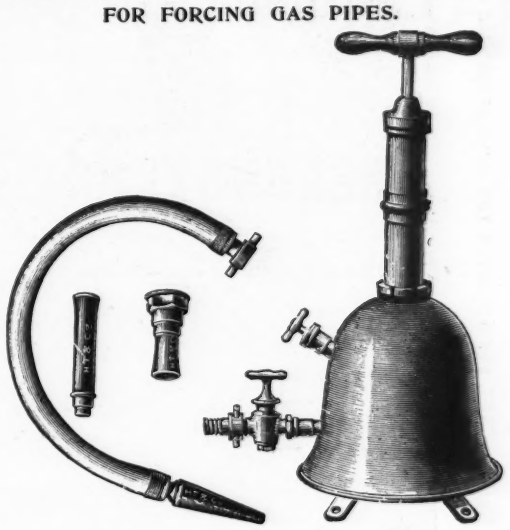

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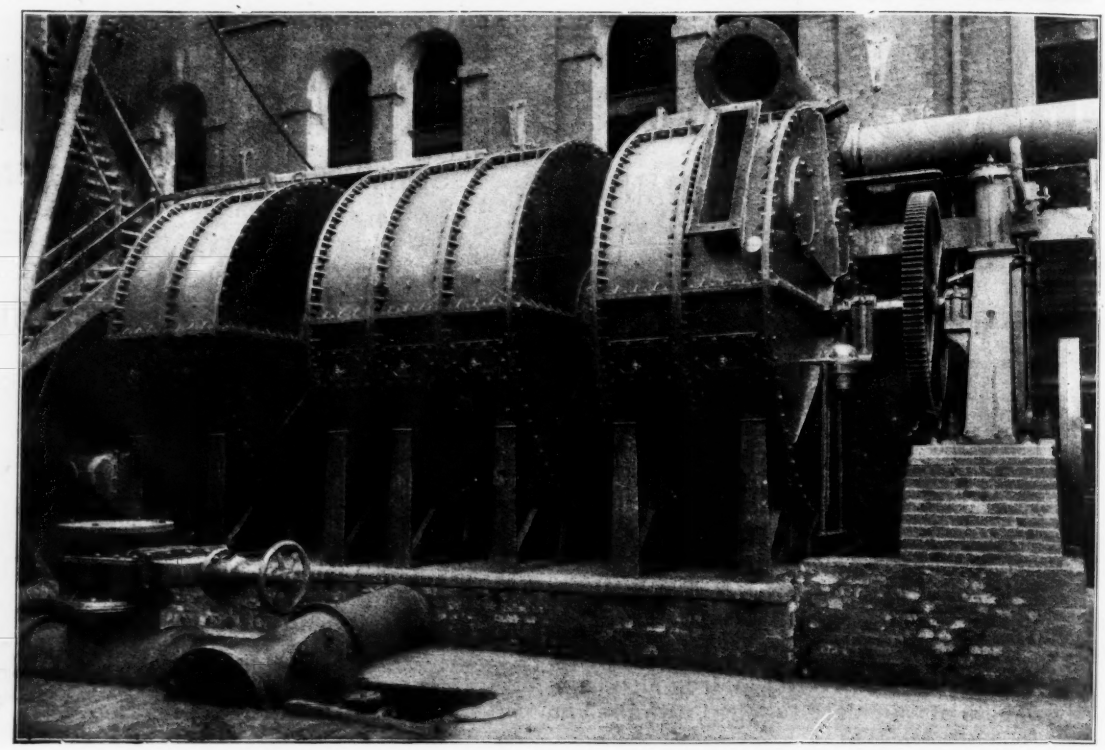

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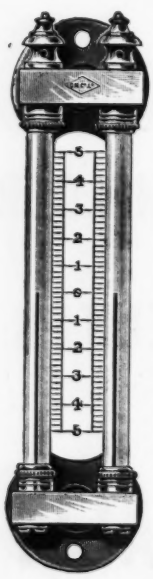

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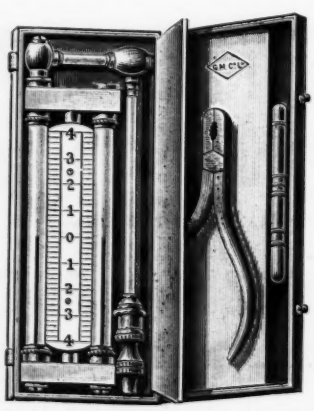

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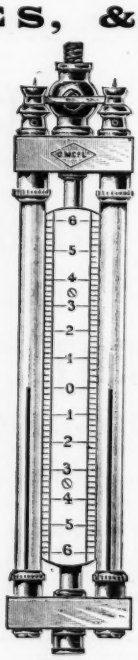

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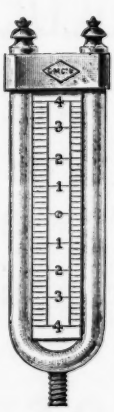

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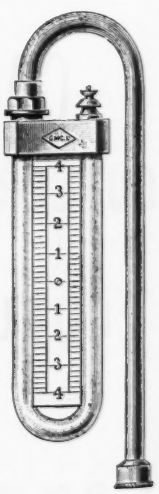

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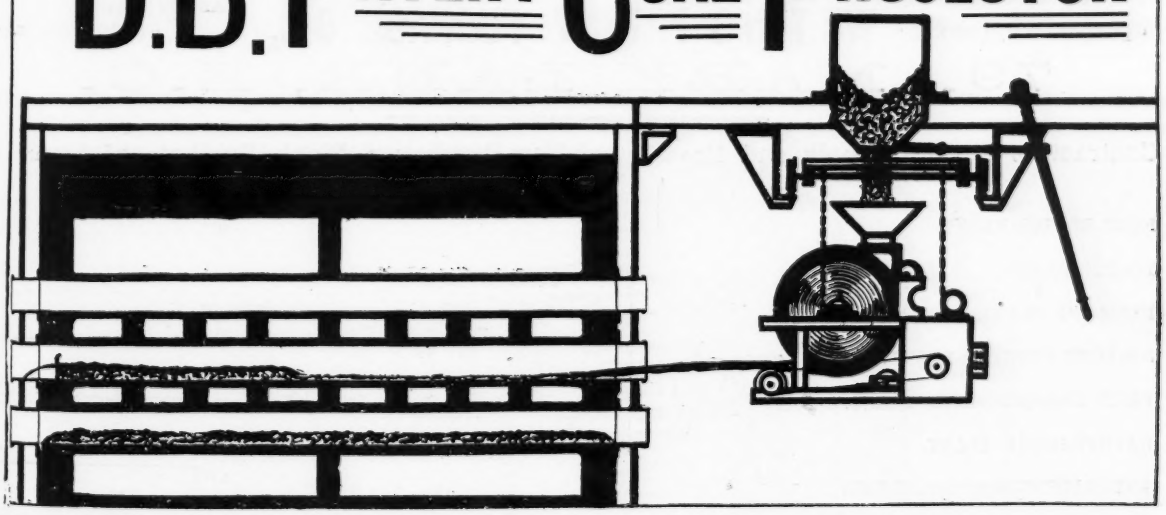

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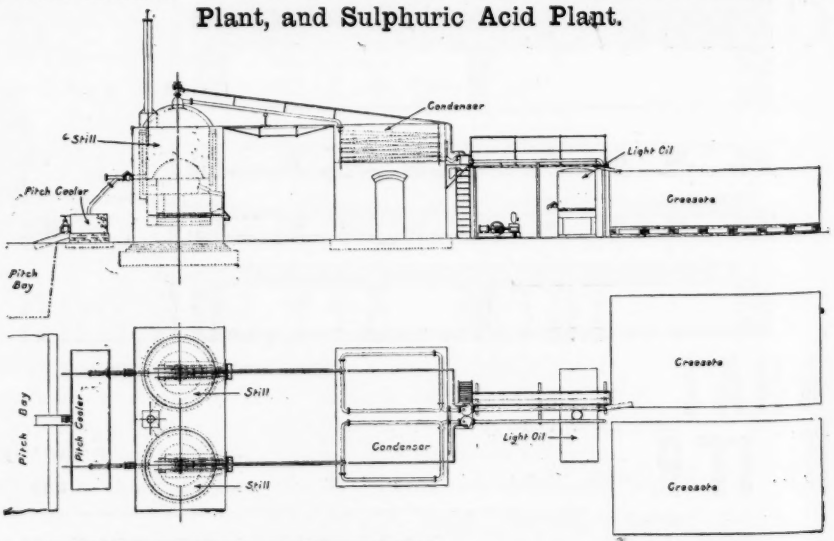

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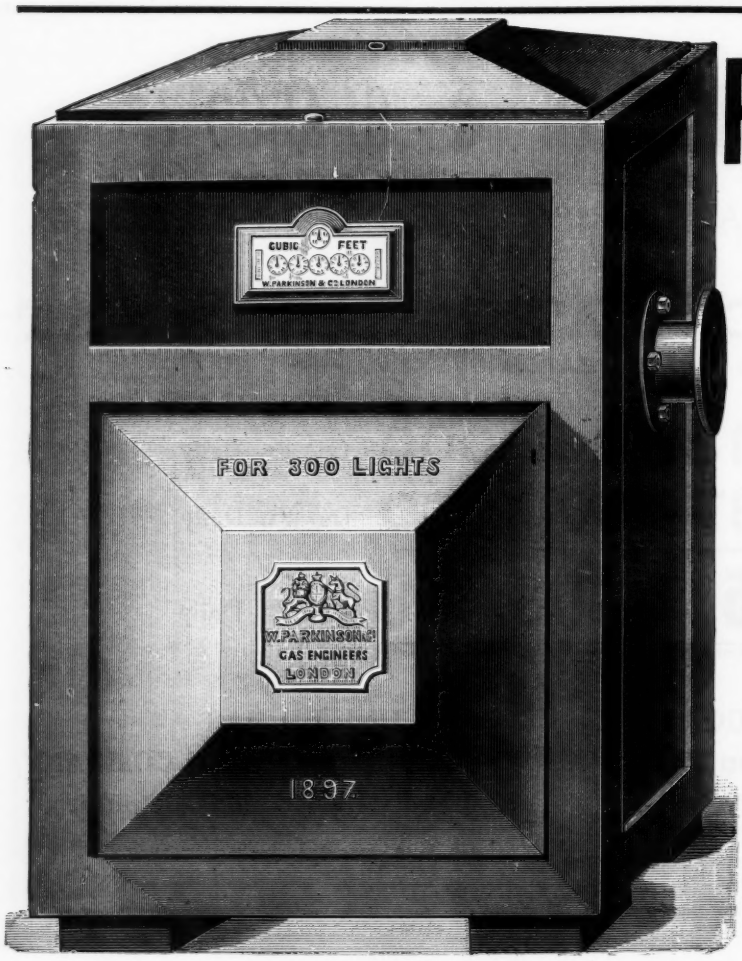

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EDITORIAL NOTES.

The Parliamentary Notices.

THE parliamentary notices for Bills to be promoted next session are now completed; and a list of the measures relating to gas and water supply will be found elsewhere. Inasmuch as these Bills, and the Provisional Orders for which application is to be made to the Board of Trade and the Secretary for Scotland, are signs of life and growth of the gas industry, it is gratifying to be able to report that in number and importance these measures are fully up to the average of recent years. The forthcoming session consequently promises to be a busy one. Up to a quite recent date the prospect was very different—most of the Parliamentary Agents being inclined to believe in the nearness of a dissolution. Certain Ministerial statements, however, opportunely set all doubts on this point at rest, by making it clear that the present Administration have no intention of going to the country for another twelvemonth at least. The result of this assurance is the good crop of notices that have come to hand.

We cannot, of course, go into many particulars as to the character of the legislative programme on this occasion; but certain indications of the scope of the most important Bills suggest the promoters' intentions. The London County Council mean to assail the London Companies again; their notice of a fresh Gaslight and Coke and other Gas Companies' Acts Amendment Bill being of a more sweeping character than ever. The full notice declares that the object of the Bill is to "make further provision for securing the due perform-"ance" by the Metropolitan Gas Companies of their statutory obligations with regard to the illuminating power, purity, and the pressure of the gas they supply. What the Companies have done, or have left undone, that they should be visited with this implied censure, or what the unhappy Metropolitan ratepayers have done to be taxed with the costs of these incessant parliamentary campaigns of the London County Council, must remain matters for conjecture. The marvel is, if all this gas-testing legislation is essential to the welfare of the Metropolitan population, how the rest of the gas-consuming world contrive to get on without it. Incidentally one learns that the London County Council have approached the Corporation of the City of London with a request for the co-operation of the Corporation in the promotion of the Bill; and this they promptly declined. It is hardly likely that the Corporation, who have always known how to look after the gas supply of the City, would at this time of day fall into a procession behind the upstart County Council, who change their gas policy from one year to another. At the same time, the Corporation promised to support so much of the Bill as they might approve, always subject to the proviso that it left them the supreme authority for gas in the City. The Corporation are fully aware that, whether the would-be autocrats of Spring Gardens talk gas, or water, or anything else, their secret ambition is always to get Parliament to accept a Bill which shall somehow place the Council before the Corporation. It must be very unpleasant for the ancient Corporation to have to suspect the approaches of the Council in this way; but such is unhappily the fact. The Corporation must perpetually play Brer Rabbit to the Council's Brer Wolf.

As was expected, the Crystal Palace District Gas Company mean to try their luck again; and their neighbours, the Croydon Company, are likewise promoting a Bill. The Leeds Corporation contemplate bringing their gas supply arrangements thoroughly up to date. The Rotherham Corporation are in the same case. The South Shields Company are promoting a most important measure, with far-reaching provisions. The Tynemouth, Southend-on-Sea, Sutton, and Ryde Gas Companies are among the smaller concerns which find themselves in need of more statutory elbow-room. The Northampton, Romford, Waltham Abbey, and Worthing Gas Companies are applying for Provisional Orders; and across the Border, the Airdrie Company are in the singular position of testing the suitability of the new Scottish procedure with regard to an opposed Provisional Order. Beyond this, there is nothing to add on the prospects of the session until the prints of the Bills come to hand. The testimony which the notices afford as to the reality of the growth of the national industry of gas supply is undeniable; and we can only wish a good deliverance to the numerous gas undertakings included in the list.

It is specially interesting to note that the speculation in "power gas" has increased this season, and is seeking fresh fields as well as proposing to more effectively occupy the claims already staked out. The North-Western Electricity and Power Gas Company are going to Parliament again for more land and other facilities; and the County of Cheshire, cut out from the Act of last session, is to have a Power Gas Company of its own, with a nominal capital of a million. Another venture of the kind is on foot for the benefit of Belfast and the North-East of Ireland, with a central station in the city itself. This latter appears to be a strikingly bold proposal.

The Manchester Institution Meeting—Gas Departments and Local Fitters.

THE final meeting of the District Associations for the year was held last Saturday with that of the Manchester District Institution at Halifax; and the meeting sustained to the end the excellence of the twelve months' record of work done by the territorial organizations. It is many years since the Manchester Institution were represented by one of their number in this good old town of the West Riding of Yorkshire; and it has not been long, on the restoration of that representation, by the appointment of Mr. J. Wilkinson as the Engineer of the Corporation Gas-Works, before an opportunity was found for a visit of the members. Their reception by the Chairman (Mr. G. H. Wadsworth) and some of the members of the Gas Committee of the Corporation who were present at the luncheon, was of a hearty and kindly character.

The features of the business meeting, at which the President (Mr. S. R. Ogden) was in the chair, were two papers and a discussion on cognate subjects. One was an argument by Mr. A. E. Mottram, of Ossett, showing excellent cause "Why Corporations and Companies should Undertake In-"ternal Fitting Work;" and the other was by Mr. S. Meunier, on "Incandescent Lighting and Maintenance." There was just sufficient overlapping between the papers to make a good connection; but both authors imported into their respective topics new ideas which refresh one's interest. There was a superabundance of points for discussion; and the members did their best off-hand with them. But that very superabundance was the obstacle to full justice being done to any one of them. Besides the suggestion contained in Mr. Mottram's paper, it was, although unintentionally so, a tribute to the enterprise and resource of the author; and it shows what those qualities in the management of a gas business can do in its extension and in the surmounting of difficulties. The slot-meter system has long since made it abundantly clear that the gas industry previous to the advent of that system lost many years of fruitful business by their *laisser faire* policy beyond the index of the consumers' meters; but this is changed now, and with the change has come increasing prosperity, and something else in the case of the municipal gas undertakings. The cry has gone up from the gas-fitting traders and plumbers that the municipalities are trenching on the ground of private enterprise. We have little sympathy with any such cry. Dead as the "JOURNAL" is against municipalization, when a gas undertaking does pass into the hands of a local authority, our desire is to see it flourish. Trading gas-fitters and plumbers have done nothing to popularize the use of gas, and they have had no part in bringing into being and fostering the slot-meter system; and had the development of outside business—in the slot-meter, incandescent lighting, and heating and cooking branches—been left in their hands, the gas

businesses of municipalities would have gained little. But as Mr. Mottram very truly suggests, the development that has come from within must have brought a share of the new business to the gas-fittings firms, who are now full of complaint and vexation over the activity of the local authorities. They have, we venture to assert, little cause to be; and if they examine their returns in this branch of their trading, they will find that this activity, instead of having had a detrimental effect, has produced a fair improvement in those returns. But they want more, and will not be satisfied to remain as they are.

Looked at from this and other points of view, we are afraid that most municipalities will set their faces against the proposition which Mr. Meunier advances to overcome the objections of the local gas-fitters, of acting as the senior partner in the firm of "Gas Department, Plumber, and Co.," and taking upon themselves (it seems to us) all the responsibility and capital expense. The idea looks at the moment unworkable; but we are open to conviction by experiment that it is otherwise. The *alpha* and *omega* of the gas-fitters and plumbers' business are profits; the *omega* of the gas department's business is the welfare of the gas undertaking. That is the end of the means (represented by the work beyond the consumer's meter) adopted by the gas departments to give satisfaction to consumers, and to supply their requirements. The interests of the local fitting firms and of the gas department are anything but identical. As what the former want is direct profit, and as what the latter want is primarily increasing strength for their gas business, the work cannot be done so cheaply by the one as the other. This is shown by Mr. Mottram to be the case even on the comparatively small point of maintenance. Again, after the work is done, the interest of the local tradesman ceases, but not so that of the Corporation Gas Department. The tradesman, in every such case as this, will do nothing more than he is paid for.

This touches on another point, and that is the risk that a gas department take upon themselves on entering upon work beyond the meter, and which work has become to be a necessity not only in view of competition and the defence of the gas interests, but as serving to increase the conveniences and comfort of the community. True, events have proved that the risk is not a great one; but Mr. Mottram cites one or two instances to show its existence. The point has weighed with him to such an extent that he has been preparing, in this connection, an insurance scheme to lay before his Committee; and he goes farther and suggests a mutual insurance fund on the part of gas undertakings. In Mr. Meunier's suggested "firm," who is going to bear this risk? With such a firm, there would not, or could not, be the same amount of supervision exercised as where the work was entirely in the hands of the gas officials; and so the liability to accident would be the greater. However, these are all points which are worthy of full consideration and discussion before finally condemning the proposal; and the only way to obtain adequate consideration is by raising the obvious objections.

The two papers, as already pointed out, were prolific in topics for comment and debate; but we cannot make a complete survey of them here. Mr. Mottram emphasizes the importance of lending an incandescent burner in the case of slot systems; of gas undertakings providing for the public lighting of small surrounding villages on the hire-purchase system; and of having a proper and efficient inspection of house fittings. Mr. Meunier makes a comprehensive examination into the question of maintenance; and the statistics which he has carefully compiled show the conditions, in connection with maintenance, which contribute to the extension of the life of mantles. We are tempted to join issue with the author (who is usually instinctively keen on the commercial side of the gas business) over his suggestion that the lowering of the standard of illuminating power "cannot be done in many towns in this" [the Manchester district] "until incandescent lighting has become general." Of all districts, it seems to us that the Manchester is the very one in which the lowering of the standard of illuminating power should be brought about as early as possible. It is in that district (and Mr. Meunier is not unmindful of the fact) that producer gas is largely on the increase for power purposes; and, so far as lighting is concerned, there is, in the district as in others, sufficient incandescent lighting to warrant the lowering of the illuminating power. The dependence of the lessening of the illuminating power should not rest, in these times, upon incandescent lighting becoming general; but rather the days of general incandescent gas lighting should be hurried forward by the adoption of a lower (and consequently cheaper) illuminating grade of gas. If the reduction is to wait for incandescent lighting becoming general, it will have to wait a long time; for the maintenance of a high power is the most effectual way of preventing the widespread adoption of the incandescent burner. These references to the matter of which the two papers are composed will be sufficient to carry to them and to the discussions the further attention that they deserve on the part of those who are reponsible for the successful administration of gas undertakings—particularly of those in municipal ownership.

Gas-Mains and Street Subways.

For some time past, the Royal Commission on Locomotion and Street Traffic in London have been taking evidence on the matters included in the terms of their reference; and in the course of the proceedings the subject of the laying of gas and water mains in the streets, and the question of subways, have been frequently mentioned. The latter question is notoriously one on which the general ideas of untechnical persons, and the instructed opinions of engineers with experience of the laying down and use of mains and cables, are in conflict. To the general public, the proposition that all the mains and service-pipes should be carried in subways appears to be beyond dispute; whereas the engineer, while not contesting the abstract proposition, feels constrained by numerous practical considerations to protest that the descent from the abstract to the concrete is an exceptionally difficult step in this connection. In the case of any new streets, for example, the theory and the practice can usually be reconciled without much difficulty; but this does not carry one very far, because the making of new streets in an old town, especially in the central area, is a very infrequent operation. Towns grow by suburbs; and nobody has ever suggested that a pipe subway should be constructed in every new suburban street which may in course of time become a crowded thoroughfare. Consequently, though for many years the Metropolitan Authorities have never constructed a new central thoroughfare without providing pipe subways in it, the number of such works, and their extent in comparison with the area of the Metropolis, are few and small.

At the present moment, the London County Council are in possession of a rare opportunity for making an ideal main street, in the "Kingsway," with an underground tramway and accommodation for all gas and water mains, electric cables, hydraulic power pipes, and telephone wires. After all, the construction will not greatly differ from the older Metropolitan and District Railways as made under the Marylebone Road and the Victoria Embankment—except in the matter of expense. It now appears that the prime cost of the Holborn to Strand and Embankment scheme will cost at least six millions instead of five millions as was originally estimated. Besides, the recoupment building sites on the line of route are not letting so well as had been expected—indeed, the new frontages are not letting at all, except, perhaps, some of those actually in the Strand. The reason probably is that the scheme, costly as it is, does not go far enough. The beginning and the end of the new thoroughfare should have been farther apart.

To return to the problem of the gas and water mains, Alderman J. H. Robinson, of the Stepney Corporation, has just told the Royal Commission that there should be a central authority to control the breaking up of streets by gas and other companies; "but it should not be the County "Council." The same observation will apply to the tramlines. Stepney would not object to an independent tribunal to deal with questions of traffic, to consist of one representative of the County Council, one elected by the Borough Councils, and one appointed by the Board of Trade. It would have been more to the purpose to advocate a London Streets Commission, on the lines of the Commission of Police. But here, again, the failure of the County Council to command respect is conspicuous. Nor is the reason for it far to seek; being nothing more nor less than the prevailing suspicion that this body does not act "on the square." All the Committees are under the imputation of being instigated by ulterior motives; and the type of men who run the show is not such as to inspire confidence. It is a pity that this should be so; but it would be ridiculous to blink the fact.

Sir George Livesey's Invitation.

WHATEVER differences may exist between the characters of Sir George Livesey and the late Charles Darwin, they are very much alike in this respect, that the former would probably subscribe heartily to the favourite saying of the latter, that "it's dogged as does it." Never was there a more determined pusher-home of a point of controversy which appears to encounter some obstacle. We have preferred to allow a week to pass before commenting on Sir George's last letter, in order to allow the subject of it to sink into the minds of our readers, and so to keep the topic open for a little longer. It is very difficult to really interest employers of labour in gas manufacture in industrial questions that are not actually pressing for an answer. They are, as a general rule, good employers. Nobody thinks otherwise of them, as judged by ordinary standards; though those who have thrown themselves enthusiastically into the good cause of the Sunday rest have sometimes had occasion to speak scathingly of the apathy of certain gas directors and committeemen in this regard. The worst that can be urged against these well-meaning gentlemen is usually that they have little imagination in respect to industrial matters. Consequently, they do not see far enough beyond their respectable noses to initiate anything likely to prove of much service to the State. Accordingly, they are numbered in the great army of those who prefer to leave things alone, so long as things will be kind enough to leave them alone. Sir George Livesey is different. We, as a rule, sympathize with his aims, and always admire his pertinacity in sticking to what he believes to be his duty; but we cannot see eye to eye with him in all his advocacy of the causes he takes in hand.

For example, take this question of the conditions of success of profit-sharing and co-partnership schemes. There is no difficulty in agreeing that the initiative must come from the employer. The moment one admits this, however, one is faced with the further question of how much power over the working-out of a scheme, after its initiation, should remain with the employer. Most of the profit-sharing schemes that have been abandoned after trial were determined by the will of the employer, from which, in the circumstances, there is no appeal. The workman knows this, and he resents it. If there is one thing more than another that galls the Briton, whatever his place in the Commonwealth, it is the sense of being dry-nursed. He likes his liberty, even to the point of being able to misuse it, if it so pleases him. As an observer of the conditions of Labour in the United States has remarked, the men have a great aversion to being "personally conducted," even into the Promised Land. They prefer to work out their own commercial salvation; and no Trade Union will yield this point unless its power has first been broken. We mention these things not out of hostility to Sir George Livesey's views, but in order to allow due weight to the difficulty of giving universal effect to them. Again, it is a question of preparing the soil. We are not at all persuaded that where profit-sharing has failed, or where it has not been attempted, the reason does not lie in the matter of preparation.

Employers must not expect too much, nor workmen think it incumbent upon them to make too great a difference on account of profit-sharing. The American observer to whom reference has already been made—Mr. Egbert P. Watson—has made the mistake, quite natural in the circumstances, of accepting the men's view of a profit-sharing arrangement as a kind of premium on over-exertion. He says: "A "workman said to me that one experience of profit-sharing "was enough for him, for, after working twice as hard as "he ordinarily did, and turning out a great deal more work, "all he had to show for it at the end of one year was $75. "As he got $3 per day, his profit in 300 days was about "25 days—about one-sixth of what he felt it ought to have "been. At the same rate, he said, he would have to work "ten years to make $750; by that time he would be dead "—under the high-pressure system." Sir George Livesey would not hesitate to agree that a little more preparation of the ground beforehand here would probably have prevented this disappointment. Profit-sharing does not mean overwork; it seeks its justification in the creation of a new spirit. The workman feels that his interest is with that of the employer, instead of against him; and this pays.

We do not wish to labour the point of preparation, in the particular respect to which exception has been taken by Sir George Livesey; but, really, it is impossible to regard the great clearance of the disaffected out of the South Metropolitan service in 1889 as other than a preparation for the unhampered germination of the seed that had been sown. The effects of this piece of husbandry operated in the two other instances mentioned by Sir George, and might probably be still depended upon to show themselves elsewhere. In that sense, doubtless, further preparation would be unnecessary to day. It is impossible to withhold assent from the impassioned adjuration of Sir George to those whom it may concern, to take a hand in the great sowing forthwith, while the season is calm. The opportunity, indeed, is open; and the time is ripe. What has already been done by some, others can do even more easily; and it is no small reproach to the many gas directors and works managers who profess to be admirers of Sir George Livesey, that they do not in greater numbers pay him the compliment of imitation in this respect.

It is only fair to the working staff of the Crystal Palace District Gas Company, from the highest to the humblest, to draw attention to the remarkable testimony of Mr. S. Y. Shoubridge, which we have pleasure in publishing to-day, in support of the general good effects of the co-partnership system in their case. The second paragraph of Mr. Shoubridge's letter will be very difficult to get over by those who are honestly doubtful of the asserted success of the system, measured on the largest scale. To the prejudiced, of course, it is waste of time to appeal; but there is hope for such as are merely incurious. To those who may be disposed to suspect the ethical results ascribed to what is essentially, in the first place, a policy of the pocket, the counsel may be respectfully addressed to look up what Cobden, as reported by Morley, had to say on the far-reaching consequences of purely economic influences. Whatever may be thought nowadays of much of Cobden's teaching, it will always stand to his credit that he maintained, if he did not discover, the great rule that the secular happiness of a people depends upon their worldly prosperity and consequent contentment. Mr. Shoubridge, moreover, does not gainsay our proposition that some husbandry is necessary to ensure that the good seed falls into the proper soil. We have no desire to split straws over the meaning of the term "preparation" in this connection, or even to distinguish between what goes before and what follows the institution of a profit-sharing system that is to grow, and eventually blossom into a self-sustaining co-partnership. We do hold, however, firmly to the belief that to pitch a scheme of the kind at the heads of the employees in any firm, with the idea that it will prove competent to work itself, is to court the failure that has so often resulted from clumsy experiments of the kind. Mr. Shoubridge says as much; and the question of fact is only one of degree. If Sir George Livesey is right, so is Mr. Shoubridge; and we must humbly claim to be in the right also. All reforms that are worth doing involve a certain amount of pains, and a good deal of forethought; and this one is no exception to the rule.

The Law of Public Lighting Contracts.

A CURIOUS and interesting point of the law as to gas supply for public lighting has arisen at Uxbridge, and has aroused some legal controversy. Yet the point is really a small one, which would scarcely have occurred to anybody but a very conscientious lawyer. It is a question whether a gas company should or can be required to give a bond to a local authority as security for the due performance of a contract to supply gas and do the rest of the service of public lighting. The Clerk to the Uxbridge Urban District Council thought such a bond necessary, under sec. 174, sub-section 4, of the Public Health Act of 1875. This the Secretary of the Gas Company denied; pointing out at the same time that the Council had not considered it necessary to give public notice of the contract, as required by the same sub-section. This impeachment was owned by the Clerk in his rejoinder; but he contended that it did not matter. His position appears to be that the Council can do what they like; but the Gas Company must do as the Council please. This is rather a "tall order." A piquant incident of the dispute is that the Secretary of the Gas Company wrote to a number of other Secretaries to ascertain what their experience of these agreements is; while the Clerk wrote to the "Justice of the Peace" on the subject, and obtained an editorial opinion in favour of his contention, based on the case of the *British Insulated Wire Company v. Preston Urban District Council*.

We venture to remark that the case cited is completely

beside the point. The section does not apply to the service of public lighting by a statutory gas company, and has never been so held. It is not even included by Michael and Will or Reeson in their collections of gas law. The obvious fact is, that agreements for public lighting by gas do not belong to the category of contracts for which there is any possible competition. The sanitary authority must obtain the supply of gas for the public lamps from the authorized undertakers, where there are any; and they cannot go outside to get it. It would therefore be idle to give "public "notice" of such a contract, the security for the due performance of which is quite other than that prescribed by the particular sub-section mentioned, which only applies to contractors in general. The British Insulated Wire Company were contractors of this order, in the cited case, not "authorized" persons within the meaning of section 161 of the Act.

Unquestionably, the proper practice in relation to public lighting contracts by authorized gas undertakers is to insert in the agreement a penalty for non-fulfilment under sub-section 2, section 174, of the Public Health Act; and therewith the law is obeyed. This was duly done by the Secretary of the Uxbridge Company, and it ought to satisfy the District Council now as it has done for 28 years past. If the Council are so ill-advised as to insist on their belated view of the requirements of the law, they must take the matter into the High Court. In order to succeed there, however, they will need a better precedent than anything they appear to have at present to guide them. We have no knowledge of any such precedent; and unless and until such guidance is furnished, we shall continue to hold the view of the law herein expressed, which is certainly in agreement with the practice of sanitary authorities and authorized gas undertakers.

The Number of Years' Purchase.

In his letter in last week's "JOURNAL," Mr. H. Lomas, the Clerk of the Rickmansworth Urban District Council, suggested that an article which had recently been published in these columns appeared to endorse the idea that the Rickmansworth Gas Company were likely, in the forthcoming transfer arbitration, to obtain 28 or 30 years' purchase; but it was pointed out in an editorial note to his letter that the article in question did not express any such opinion. It may, however, not be out of place here—for Mr. Lomas's guidance merely, and without any desire on our part to discuss the matter before the inevitable arbitration—to call attention to the fact that no less an authority than Mr. H. E. Jones never takes less than 28 years' purchase of the profits for statutory gas undertakings, which are in all respects in good condition. If Mr. Lomas wants chapter and verse for this statement, he can get them by looking up the proceedings in the Poulton arbitration last year. He may take shelter behind the words "which are in all respects in good condition." This qualification is amply met by the exuberant manner in which Mr. H. F. Jones spoke of the prospects of the Rickmansworth undertaking twelve months after his father committed himself to the 28 years' rule. He said the opportunity for acquiring the Rickmansworth undertaking was a "golden one," that their average profits in the past three years were £1011, and that, if the works were better managed and the plant enlarged, greater profits would be obtained. Mr. Lomas will surely not argue that this evidence should be left out of consideration; while Mr. H. E. Jones's 28 years' purchase rule should not be altogether lost sight of. Messrs. H. E. Jones and Son are the Engineers who are advising the Rickmansworth Council in this matter. It may be further suggested that Mr. Lomas should study the number of years' purchase in the cases of Devonport and Colwyn Bay as being recent representative examples.

A Hint from Electrical Competitors.

Has it ever occurred to the great Gas Companies in London to try to make arrangements with owners of new property to advertise gas in some prominent manner? If not, they had better send a representative into Tudor Street, Blackfriars, and take a hint from an electrical competitor. This is the first time we have noticed any enterprise of the kind from the same quarter. In the street named, a huge building has recently been erected; and the owners are now prepared to let it for business purposes. In eight of the windows are posted eight large bills, printed boldly in red and black; and they cannot fail to attract the eye of every passer-by. The imposing characters announce that the bills emanate from the City of London Electric Lighting Company, Limited; and the addresses of their power works and registered offices are given. The succeeding lines inform the reader that electric power can be had at low rates; that "motors are supplied for all purposes on the hire-purchase system;" and that full information can be had on application. Why should there not be bills alongside these making a similar announcement from the Gaslight and Coke Company? We see no reason, unless the owners of the property are interested in the City of London Electric Lighting Company, and not in the Gas Company. A stratagem of this kind for gaining an advantage must, if possible, be met by a like movement.

A Criticism of the Workmen's Compensation Act.

The writer of the "Insurance Notes" in the "Financial Times," who has on several previous occasions referred to curious questions which have arisen over the Workmen's Compensation Act, expresses the hope that the official investigation which (as was mentioned in the "JOURNAL" last week) is now being undertaken with regard to the operation of the Act, with a view to its amendment, will be carried out in a sensible way. The Bill, he says, was miserably drafted to begin with, and "was repaired and altered by a crowd of zealously ignorant amateurs until it became a maze of stupid obscurity." What is really wanted in the present case is an absolute repeal of the whole statute, and an entirely fresh drafting, made in the light of experience, and in plain language. The suggestion he makes is that the matter should be put into the hands of three or four good insurance men, who know by experience all the points where doubt comes in, and two or three capable lawyers, whose experience will prevent the insurance men from drafting the Bill in their own favour. They should then be able between them to set down in plain English what is needful to make the measure clear. The writer remarks that "an objectionable fetish in British legislation is the practice of always passing 'an Act to amend an Act,' which often leads only to fresh complication," and that the entirely new statute which is required can only be properly drafted by practical men who have themselves struggled with the uncertainties of the existing Act.

An Illustration.

The author of this somewhat strong criticism quotes, in support of his statements, the following "fine example of absurdity" in the operation of the Workmen's Compensation Act which was revealed recently in the City of London Court. A boy who was cleaning a bicycle nipped his finger in the chain, and had to get the point of it cut off. His claim for compensation was resisted; but the legal decision was in his favour on the grounds that, though no mechanical power was used, yet, as more than twenty persons were employed, the shop was a "factory," and because, being a "factory," the building was more than 30 feet high. The writer of the article says, with regard to this decision, that "it would take the wisdom of the 'Mad Hatter' to see a connection between these two facts and the damaged finger of the urchin; and it is not easy to write seriously about such comic opera legislation. If the master had chanced to pay off a superfluous light porter the previous day, or if a gale of wind had blown down a chimney pot, it is quite possible that the boy industriously rubbing up the bicycle on the ground floor might have had no claim for his lost joint; and it is not seemly that English law should contain such a grotesque inconsistency."

Another Phase of the Paris Gas Question.

Since the subject of the future gas supply of Paris was referred to in our columns, nothing has occurred to lead to the supposition that an early solution of the difficulty will be arrived at. The project for municipal control is still a controversial topic, and it seems likely to continue so. In the discussion of this literally burning question, thought has been mainly concentrated upon the city, and comparatively little attention has been paid to the outlying districts. These, however, according to "Le Gaz," have been by no means indifferent to what has been going on. Conferences have been held between the authorities, the outcome of which has been the formation of a Company who have under-

taken to supply gas for about 3s. 6d. per 1000 cubic feet, on condition of being granted a concession for 30 years from Jan. 1, 1906. It is reported that no less than 45 of the communes have pledged themselves to support this scheme, and that their action has received the approval of that redoubtable personage the Prefect of the Seine. At the head of the concessionaries stands M. Chamon, whose name was prominent, during the debates in the Municipal Council, in connection with his proposals for the settlement of the gas question. This gentleman, in conjunction with M. Rouland and others, has arranged to transfer their rights to a Company which has been formed for the supply of light, heat, and motive power. This concern is to continue in operation for 99 years from Sept. 4, 1903, and the capital is fixed at 1,200,000 frs. (£48,000), in 4800 shares of 250 frs. each. The first Board of Directors has been nominated, and, of course, the gentlemen whose names are mentioned above are members of it. It is stated by our contemporary that the new venture is in no way antagonistic to the shareholders in the Paris Gas Company, who will have the right to an allotment of one-third of any fresh issue of shares that may become necessary. It is thought to be not beyond the bounds of possibility that the older Company will, after all, obtain a prolongation of their concession. Should they do so, the curtailment of their operations by the severance of their outside districts would necessarily make a difference to them; but it would not deprive them of more than 10 per cent. of their revenue. It is almost time that something definite was settled, as in two years from now the Company's concession will have only a few days to run.

Signs of Change in America.

Judging from the inquiries that are being made by American gas engineers, their attention is being largely diverted to coal gas manufacture after a considerable period of devotion to carburetted water gas; and the opinion of those who have had opportunities of making independent inquiry into the matter is that, in immediate extensions on the other side, coal gas will have the more prominent part. Mr. Charles Carpenter mentioned this matter at the recent meeting of the Southern Gas Association; and, on the authority of an American gas engineer, he put the revulsion of feeling in this regard down to the autocracy of the Standard Oil Company in the American oil market. Mr. John West, on his return from America, confirms Mr. Carpenter's statement; and he tells us of talk on the other side of diminishing oil supplies, of a lowering of the available stock of oil, of an important and profitable new outlet for oil having been found for motor purposes, and of the prospect of oil becoming dearer in that country. He has every belief in the correctness of his information on these points, and has faith that coal gas is going to have a bigger innings in America in the near future than it has had for many a long day.

The Subways Competition.

Throughout the past week, there have been on view in the old Council Chamber at the Guildhall, the drawings and essays submitted in the competition instituted by the Paviors' Company in connection with the placing and maintenance in subways of all pipes and services of gas, water, and other undertakings. There were in all about 36 competitors; but the amounts of the prizes offered were apparently not sufficient to attract anyone from the realm of engineering eminence. The first prize was for 100 guineas, the second 30 guineas, and the third 20 guineas; but no man of standing could afford to risk being outstripped in idea by a comparatively unknown man for even the highest of these monetary awards. The three successful competitors in the order of adjudged merit were Mr. R. M. Parkinson, of Peterborough, Mr. A. J. Price, of Lytham, and Mr. F. M. Royle, of Nottingham. That Mr. Parkinson fairly won the palm, we are content to believe, in view of the fact that the determination of the awards was in the hands of Major Isaacs (the Master of the Paviors' Company), Mr. D. J. Ross (the City Engineer), Mr. J. W. Bradley (the City Engineer of Westminster), and Mr. W. Weaver (the Borough Engineer of Kensington). We give to-day some extracts from Mr. Parkinson's essay, but, owing to the length, have been compelled to omit many of the details of the various schemes he submitted, as well as the estimates. To a large extent the former may be gathered from the drawings which accompany the essay, and which drawings, in our opinion, constitute the most interesting part of his contribution. The estimates at the best can only be regarded as hypothetical, as in every case they would be altered by the circumstances. Mr. Parkinson is particularly qualified to deal with this subject, having been responsible for the preparation of the parliamentary plans for a number of the London subways, and having at his back a good experience in the laying of gas and water mains, and in the superintendence of the construction of heavy underground works in London. But the main question is: Will any real good come out of this enterprise of the Paviors' Company? We rather doubt it. It is a comparatively easy matter to plan several methods of constructing subways for the accommodation of pipes and wires; but it is a far different matter to devise a scheme that could now be applied throughout the main arteries of this great Metropolis. It was the congested state of the streets of London when some electric lighting and telephone work was being executed, that revived attention to the subject of subways; and it would have been of greater interest if the competition had been specially and definitely directed to London. Mr. Parkinson in his essay, speaking from his experience, avers that no plan can be recommended as applicable in any particular instance; and verily it would require a good many plans, untold expense, and years of street defacement and inconvenience, to construct subways in the main thoroughfares of London, and remove the public services into them.

Some Figures Regarding Public Lamps.

In connection with a proposal to improve the street lighting of the City of Birmingham and its suburbs, the Public Works Committee have had under consideration an interesting report by Mr. John Price, the City Surveyor, dealing with the conditions under which the larger towns in the United Kingdom are lighted. One of the points which the Committee had before them was whether it would be better to increase the number of hours during which the lamps are lighted, or to reduce the time now occupied in lighting them; and, as will be seen from the notice which appears elsewhere, the Committee decided in favour of the first of these alternatives. In Liverpool, the lighting of all the lamps is accomplished, on an average, within one hour; whereas in Birmingham the average time taken is between five and six minutes longer. Mr. Price, however, found that to increase the rapidity with which the lighting is performed in Birmingham would involve a greater expenditure than an addition to the number of hours during which the lamps are alight. In fact, he said that to reduce the time occupied in lighting to the extent of one-eleventh (which would bring Birmingham on a level in this respect with Liverpool), would mean increasing the number of lamplighters by one-tenth. Another point to which the Committee turned their attention was the distance between the lamps; and in regard to this matter, Mr. Price stated that their city was ahead of any of the places from which he was able to get returns. For the whole of Birmingham, the distance the lamps are apart works out to only 46 yards; while at Bradford it is 49 yards, at Hull 50 yards, at Liverpool and Bristol 57 yards, and at Leeds 67 yards. We fully endorse the opinion expressed by Mr. Price in the course of an interview with a representative of the "Birmingham Mail," that under the new lighting conditions there ought to be no reasonable grounds for complaint on the part of the citizens.

Municipal Gas Question in New York.

According to a cablegram just received by the "Globe" from their New York correspondent, the strike of tramway employees at Chicago (which has lately terminated in the victory of the employers) has given great impetus to the movement for the municipalization of tramways and gas and water supplies. Mass meetings are being held every evening in favour of municipal ownership, which will also be made a test question at both Municipal and State elections. One of the most influential papers in Chicago is leading the movement, and is said to be making most effective use of the "alleged magnificent success of municipal ownership in England." It seems that almost the first cablegrams giving the news of Mr. Bryan's tour in England dealt with his visit to Battersea, which, in these reports, is made out to be a sort of "working-class paradise." The glowing accounts thus sent over to America are naturally being used for all they are worth (and very likely a great deal more) by the newspaper referred to

as well as by the orators at public meetings; but it is to be hoped that, in calmer moments, due consideration will be given to the other side of the question. In New York, the movement is for the present directed against the Gas Companies, under whose "grasping monopoly" it is alleged the city has lain too long. Legal opinion has, it is said, been obtained, to the effect that not one of the Companies have a legal right to the monopoly which they exercise, and that there is nothing to prevent the Corporation from taking the supply into their own hands. In this regard, also, the success of municipal ownership of gas-works in England is apparently being made much of by the agitators; and "it has been widely proclaimed that 168 cities and towns in England and Scotland own their own gas plants, and over 300 in Germany." It is, however, somewhat difficult to understand why these American reformers need go so far afield; for there are already a large number of municipally owned gas undertakings in the States to which they could draw public attention. From all that our contemporary's correspondent says, it appears evident that our cousins in Chicago and New York are being worked up into a pretty bad state of municipal trading fever; but it is to be noted that he concludes his statement with the remark that "whether Tammany will venture to interfere with the monopolists is, to put it mildly, open to doubt."

The Power-Gas Corporation.

The report of the Power-Gas Corporation, Limited, for the year ended Sept. 30 states that the Directors propose to pay a dividend of 5 per cent. (less income-tax) upon the ordinary shares. On the previous occasion dividends of 6 per cent. (less income-tax) on the ordinary and 4 per cent. on the deferred shares were recommended; but those accounts, it is pointed out, which were made up to Sept. 30, 1902, covered the transactions from Jan. 16, 1901, at which date the business was taken over by the Corporation. It is stated that new contracts of considerable value have been secured for the installation of power-gas plant in this country and abroad, as well as for the extension of existing installations under the Corporation's patents; while satisfactory progress has been made with the contract for the gas generating and distributing plant for the South Staffordshire Mond Gas Company's first central station, which it is expected will be completed during next year. With reference to the Act which was passed during the last session of Parliament, authorizing the distribution of electricity and power gas throughout North Staffordshire and parts of the counties of Derby, Flint, and Denbigh, the Directors say they have agreed to grant a license upon satisfactory terms for the sale throughout this area of power gas manufactured under the Corporation's patents. They further intimate that they have acquired the sole rights in this country for the manufacture and sale of the appliances patented by Mr. Benjamin Talbot, for mechanically agitating the fuel in gas-producers, and have appointed him a member of the Board. The balance-sheet shows a sum to the credit of the profit and loss account of £13,082; and after payment of the dividend recommended, and writing £2000 off the preliminary expenses account, there will be an amount of £1694 to carry forward. The Auditors again state in their certificate that "the property account of the Company appears in the balance-sheet at cost price without depreciation;" but they do not, as they did on the last occasion, draw attention to the fact that an amount for "contracts partly executed, including an estimate of profit to date approved by the Directors," is included in the accounts.

Mr. HENRY SAINSBURY, who for the long period of 47 years has been the Manager of the Trowbridge works of the British Gaslight Company, has retired upon a pension; and Mr. H. B. CHAMBERLAIN, who is at present the Manager of the Company's Holywell works, has been appointed as his successor. Mr. Chamberlain, who is a son of the Secretary of the Company, was formerly Assistant-Manager at the Norwich station, under Mr. F. E. Linging. Had Mr. Sainsbury remained in charge at Trowbridge for another two years, his connection with the undertaking would have lasted half-a-century. It is pleasing to know that the Directors have marked their appreciation of his long services; and the best wishes, not only of the Board and the staff, but of the whole of his fellow-townsmen, will follow him in his retirement. For many years he has taken a deep interest in religious and educational affairs in the town.

WATER AFFAIRS.

The Metropolitan Water-Works Arbitration.

THE proceedings of the Court of Arbitration under the Metropolis Water Act, 1902, last week, reported in another part of the "JOURNAL," resulted in some rather severe reverses for the New River Company, whose claim was under investigation during that period. When the inquiry was resumed on Monday, it was continued as though the adverse decision of the Arbitrators on the previous Saturday, limiting the Company's dividend to 10 per cent., and thereby reducing the amount of their claim from £13,260,164 to £8,214,163—a difference of about £5,046,000—would not be upheld by the House of Lords, to which tribunal the matter is to be taken. Accordingly, evidence in support of the Company's original claim was called; the first witness being Mr. Samuel Wood, of Messrs. Wood, Drew, and Co. He was examined at considerable length upon the Company's accounts, which gave a total capitalized value of £13,139,377, exclusive of the Clerkenwell Estate, valued at £160,000. Apart from this estate, the Company have some surplus lands which have always been introduced into the accounts and been regarded as part of the undertaking. As the business has been a largely increasing one, Mr. Wood put in tables based upon what he estimated the net divisible profits would be for the year 1903-4. They were framed on the assumption that the water-rental would rise by £50,000 a year. But when cross-examined by Mr. Fletcher Moulton, K.C., on this point, he admitted that he was not in a position to say that the amount named was actually obtainable, though he thought the Company might get it if it were absolutely necessary to enable them to go on. Mr. Wood was followed by Mr. Francis, the Company's Engineer, in the course of whose evidence the President announced that the Board had decided to separate the Clerkenwell Estate (with the exception of certain land and houses at Holloway) from the remainder of the surplus lands, as it was not directly connected with the water-works. He subsequently cleared the ground by stating that the Court were satisfied that the Company had given *primâ facie* evidence as to the sufficiency and good condition of their works, and the adequacy and purity of their supply. The burden therefore rested upon the other side. Mr. Moulton expressed his willingness to take it up, and to show that the filters should be doubled, and that while the supply was adequate for the present, it should be augmented for the immediate future. Professor Dewar and Sir William Crookes, however, declared that the existing filters produced the best water supplied in London; while Mr. R. E. Middleton, who, as an Assistant Commissioner engaged upon the inquiry conducted by Lord Balfour of Burleigh in 1892-3, had investigated the sources of supply, expressed the opinion that they would be ample until 1907. At this point the mid-week adjournment took place.

The sitting on Thursday morning opened with the presentation of the promised alternative tables showing the effect on the Company's claim of the decision as to the limitation of the dividend. The principal item in the original claim was £12,356,400, the capitalized value of a divisible profit of £339,801. In the amended table the former sum was reduced to £7,345,309—the capitalized value of the maximum dividends of £201,996 in perpetuity. According to the revised tables, the profit balance in 1904—the year of the transfer of the undertaking—would be £327,431. Among the items in the amended tables was one of £116,291, for redeemed land-tax amounting to £3198; and the right of the Company to this gave rise to a long argument. The Court reserved their decision, and passed on to another item—£396,255 for Directors' remuneration amounting to £10,897. The Company justified their claim on the ground that the holding of one of the Adventurers' shares was a qualification for the position of Director, and that this right had always enhanced their value in the market as compared with the King's shares, which do not carry any such privilege. The Clerk to the Company (Mr. James Searle) explained that the four principal officers of the corporate body, who are required by the Charter to be appointed, were paid salaries, and the other members of the Board by fees. Mr. Moulton contended that these payments were really portions of the working expenses of the Company; and the Court supported him—deciding that

they must be deducted before the amount of dividend could be ascertained. By this decision, from which it appears there is to be an appeal, the amended claim was further reduced by £396,255. The next matter considered was the probable market value of the stock to be issued by the Water Board, which was put by Lord Rothschild at 90. The Hon. Alan Brodrick, however, said this was the probable highest value. He thought 87 might be the figure. The President then delivered judgment on the reserved question as to the land-tax. The point for decision was whether the payments by the Company were made upon their own account or on behalf of the several holders of shares in the undertaking; and the conclusion come to was in favour of the latter view. The payments were made on account of the liability of the shareholder, and were recoverable from him. This declaration not only affected the item which elicited it, but also that giving the rates and taxes.

The position of the Company as a partner in the Staines reservoirs scheme was the next matter to occupy the attention of the Court. The Company claim a sum of £120,787 for expenses in connection with the supply of water to be obtained from this source; and Mr. Middleton and also Mr. Walter Hunter, the Joint Engineers of the works, were called to speak to their condition. Against the favourable opinion expressed by these witnesses as to their construction, was set that of Sir Alexander Binnie, who declared that in about twelve years the whole thing would be broken up. In the meantime, heavy maintenance charges would be incurred. As the West Middlesex and Grand Junction Companies are interested in the scheme, a decision on the point raised was deferred. One was, however, given on the question of the liability of the three Companies to contribute to the sinking fund of the Chamberlain of London. By the terms of the Staines Reservoirs Act of 1896, all three Companies are, at the end of the half year in which water is first obtained by means of the works thereby authorized, to carry a certain amount to the fund; and the point to be decided by the Court was whether the water had been so "obtained." As a matter of fact, the reservoirs have been filled, for testing purposes, by the Contractors, and at their own expense. Strictly speaking, therefore, water has been "obtained," having been drawn from the Thames. But surely the common-sense interpretation of the terms of the Act is "obtained for purposes of supply." As not a drop of water has yet been used for this purpose, the Court decided that the liability to contribute to the sinking fund would only arise when the Companies concerned were in a position to increase their revenues by utilizing the reservoirs. This decision was the one favourable feature of the week, from the Water Companies' point of view. The question raised was one on which those specially interested have for some months been at variance with the Official Auditor; and it is satisfactory to have had the judgment of the Court upon it. On Saturday, Mr. Searle was recalled, at the suggestion of the President, and gave details with regard to the keeping of the accounts of the Clerkenwell Estate. Sir John Hollams, who was under examination on Friday, put in an estimate of the cost of distributing the stock which the Water Board will provide as the purchase price of the undertaking. He was followed by Mr. Charles Hawksley and Mr. E. M. Eaton, who spoke to the adequacy of the Company's supply. This brought their case to a close. Mr. Moulton opened the case for the Board, in reply to the Company's claim.

Water Legislation for Next Session.

THE list of notices of intended applications to Parliament next session which will be found elsewhere does not give any indication that the Legislature will be called upon to consider any project of great magnitude in connection with the supply of water. The extension schemes, both of works and limits, are, however, fairly numerous. The Barnet Company will take steps to meet the increased demand upon them by erecting a pumping-station at Little Berkhampstead; while the Rickmansworth, Bexhill, and Newcastle and Gateshead Companies will enlarge their spheres of operations. The Gosport Company cannot, in view of recent events, remain satisfied with their present sources of supply; and they will try to improve them, by going farther afield, and purchasing the undertaking of the Lee-on-the-Solent Water Company. Powers of incorporation will be sought for Companies formed to supply Littlestone, New Romney, and other places in Kent; an amalgamation scheme is proposed at Ticehurst; the Minehead District Council will endeavour to obtain possession of the undertaking of the local Water Company; and more capital will be required by the Companies at Norwich and Southend. Among the applications coming from Local Authorities, the Manchester Corporation will ask for power to construct a reservoir at Heaton Park, in connection with their Thirlmere scheme; and that of Leeds will seek to improve their water-works. The Derwent Valley Water Board desire parliamentary sanction for certain deviations from the scheme authorized in 1899. New works are proposed at Basingstoke, Selby, Skipton, and Thurles. It is in contemplation to form a Water Board for Oakengates and Dawley, to acquire the undertaking of the Wellington (Salop) District Council; and the West Riding Rivers Board will apply for protective powers over rivers and streams. A measure will be introduced to penalize the Huddersfield Corporation for failing to supply compensation water; and the New River Company will apply for an Act to enable them to apportion among the shareholders the amount they receive as compensation from the Water Board, and constitute themselves a Land Development Company. In addition to the applications for Acts, there will be about a dozen for Provisional Orders in England, and a few under the Scottish Procedure Act, 1899.

Manchester and District Junior Gas Association.—We learn from the Hon. Secretary of this Association (Mr. Fred Oldfield) that the next meeting will be held on Saturday, when, by permission of the Manager (Mr. R. Hooton), a visit will be made to the Ashton-under-Lyne Gas-Works, where considerable extensions and alterations have recently taken place, including an installation of inclined retorts and new purifiers.

Oil for Gas Making.—The Anglo-American Oil Company have just imported in their steamship *Lackawanna* about 5000 tons of Texas gas oil, thus following in the footsteps of the "Shell Transport and Trading Co.," who, previous to this importation, were the only firm importing this oil from the Texas oilfields. The Anglo-American Company have also, as have the Consolidated Petroleum Company, imported into the United Kingdom large quantities of Roumanian solar oil.

Decimal System for the United Kingdom.—Sir Samuel Montagu, the President of the Decimal Association, writes: "It has been resolved early next session to introduce into the House of Lords a Bill for the compulsory adoption of the metric weights and measures throughout the United Kingdom. The first reading of the Bill will be moved by Lord Belhaven, and seconded by Lord Kelvin; and such an encouraging amount of sympathy with this measure has been expressed privately by other peers, that there are good grounds for expecting that the second reading of the Bill will be passed. It was decided to move in the House of Peers because it was evident that the House of Commons would be pre-occupied with other affairs. But, when the measure has passed the House of Lords, it will be brought before the Commons at the first possible moment; and it is hoped that a sufficient expression of public opinion will be forthcoming, at the time when the question is being debated, to convince the Government that they will do well to make it their own Bill. . . . With the Colonies fully ready to make the reform directly it has been accomplished at home, and with the question in its present forward position, it is clear that the time is quite ripe for an energetic attempt to secure satisfactory legislation."

The Position of Thorium.—The New Export Company yesterday forwarded to us the following copy of a circular emanating from the Syndikat zum Schutze der Interessen der Gasglülicht Industrie, of Berlin. The circular was received by the Company mentioned yesterday morning, and, as they remark, it speaks for itself: "At the commencement of this year, we had the honour of calling your attention to the fact that the chief material used for the manufacture of incandescent mantles—viz., nitrate of thorium—which had already experienced a considerable rise in price, would most probably become dearer still, and that a corresponding rise in the price of mantles would, of necessity, have to follow. In the meantime, the price of nitrate of thorium has again been repeatedly raised, as expected, and, nevertheless, great uncertainty still prevails in the market with regard to the immediate outlook. Contracts for nitrate cannot be placed even at the greatly advanced prices; and to all appearances a still further advance is imminent. Up to the present time, the advance in the price of mantles has been kept within moderate limits, owing to the fact of certain old stocks of thorium or monazite sand not having been quite exhausted. Now a very brisk season having set in, these old remnants have disappeared. Under these circumstances, we consider it again our duty to acquaint you with the present state of affairs, in order that you may be in a position to make your arrangements in time, and also prepare your own customers, so that, when the expected new rise, even if suddenly declared, takes place, the market may be disturbed as little as possible in the interests of everybody."

ESSAYS AND REVIEWS.

PROSPEROUS TOTTENHAM AND A LARGE MODERNIZING SCHEME.

[Written in Connection with a Visit to the Works last Saturday, see p. 539.]

THE several issues of new capital which have been made by the Tottenham and Edmonton Gas Company during recent years, and the remarks made from time to time by the Chairman (Mr. Corbet Woodall) at the meetings of the proprietors, will have been a sufficient indication of a very prosperous state of affairs in connection with this undertaking, and of important changes at the works. Meetings of proprietors, however, are not favourable occasions on which to enter with any great detail into the nature of such changes; and therefore, an opportunity presenting itself, advantage has been taken of it to inquire further into them. The result is extremely interesting.

All who are connected with the undertaking are pardonably proud of its success. The district served is not one that is rich in palatial property; but it is rich in those consumers who belong to what are called (in the absence of better terms of identification) the middle and working classes. And Tottenham proves that they form a very fertile soil for the production of a large gas business. A diagram hanging in the office of the Engineer of the Company (Mr. A. E. Broadberry) tells a remarkable tale of progress in consumption. It commences with the year 1866, in which the output from the works was only 53,188,000 cubic feet. Year by year the curve lengthens out, until in 1902 the output reached the magnificent total of 767,032,000 cubic feet. Within only the last decade, it has more than doubled; and the yearly figures show huge strides in development, of which the signs indicate prospective maintenance. The figures are worth reproducing. The output in 1893 was 346,048,000 cubic feet; 1894, 363,659,000 cubic feet; 1895, 402,426,000 cubic feet; 1896, 457,780,000 cubic feet; 1897, 490,358,000 cubic feet; 1898, 522,851,000 cubic feet; 1899, 575,658,000 cubic feet; 1900, 660,925,000 cubic feet; 1901, 707,558,000 cubic feet; and 1902, 767,032,000 cubic feet. This year up to the present the increase has been at the rate of about 17 per cent.; so that already there is an extra output to be added to the figures for 1902 of about 110 million cubic feet, and, if there is a continuance of this rate of advancement to the end of the year, there will have been an increase of something over 130 millions. Everything points to the future being equally, if not more, prosperous. The district of supply is a large one, with extensive undeveloped tracts; and building is going on apace. The London County Council have commenced the laying out of a "colony" in the district for a population of 43,000; and by a mutual agreement between Council and Company the gas supply is practically assured to the property for ten years. The Company have agreed to supply and pipe the property at a minimum price; and for the period mentioned, the Council will take no steps in regard to the introduction of the electric light. Again, after next Christmas, the general price of gas is coming down 2d. per 1000 cubic feet—to 2s. 10d. Therefore the prospect is a pleasant one.

Such figures as those quoted are appetizing; and it will not weary readers to show, in comparative form, the extent to which the main outlets for consumption have been opened up during the last few years.

Year.	Ordinary Consumers.	Slot Consumers.	Stoves.	Public Lamps.
June—				
1898	6,672	6,446	2,134	2,341
1899	7,425	7,568	2,583	2,520
1900	8,161	8,336	3,097	2,730
1901	8,910	9,015	3,457	2,918
1902	9,798	10,431	3,905	3,196
1903	10,970	13,565	4,354	3,447

These figures show that the slot and stove branches of the business have more than doubled in numbers during the six years; but the number of ordinary consumers have not stepped forward at an equal pace. In 1899, the two classes of consumers almost balanced in numbers; this year, the slots are a considerable distance ahead of the ordinaries. The small character of the business done, which has combined to build up this height of prosperity, can be found by consulting "Field's Analysis," which shows that the Tottenham Company among those mentioned take the lowest position in the average quantity of gas sold per consumer—viz., 29,672 cubic feet a year.

Such prosperity, it goes without saying, has meant busy times for the Engineer apart from the duty of superintending the manufacturing operations. To meet this growth, the works have had to be thoroughly reorganized and extended; and a visit to them at the present time, and for some time to come, will not fail to interest—as the large scheme of remodelling and modernizing is now drawing to an end; but further extensions are planned, and will probably be undertaken during next year. Up to four or five years ago, the old works formed, as it were, the nucleus to which small attachments had been made piecemeal to meet the growth of business; but no one a few years before then anticipated what has eventuated. And so it became necessary to provide for the rapidly growing demands, and to work to some definite scheme. The ground was therefore plotted out by Mr. Broadberry for the reorganization and extensions; and he kept well in view the working in of as much of the existing plant as possible. It was, however, a case of taking the "bull by the horns," and doing the thing thoroughly. And therefore, where a building or anything else stood in the way of carrying out the project, no hesitation was made about its demolition or removal to some other site. The work so far accomplished, or which is to be almost immediately taken in hand, practically represents the entire reconstruction of the works on a more imposing scale; and it has been carried out without interfering in any way with the full supply to the consumers.

To sketch the work done and in hand, we cannot do better than start in the retort-house, which previously contained twenty settings of direct-fired and hand-worked retorts. The house has been completely remodelled; and it now contains eighteen regenerative settings of eight retorts, 22 in. by 16 in. by 20 ft., Ω section; and there are an additional six settings in a portion of what was formerly the coal-stores. The first year the work was taken in hand, half the retort-house was dealt with. For the new conditions of working, it was necessary to raise the roof by 5 feet; and this was done bodily (without the intervention of contractors) in sections of 40 feet. In making this change, too, the badly-ventilated state of the building was altered by making ample provision just under the eaves. This was a heavy job; but it was successfully accomplished in every particular. The next year the second part of the house was undertaken. Then, however, there was some uncertainty in the mind of Mr. Broadberry as to which of the two systems of retort-setting—inclined or horizontal—was the better. Therefore to tide over a period of experiment, the six settings already referred to were erected in a part of the adjacent coal-store. This necessitated a noteworthy piece of work. The wall between the coal-store and the retort-house had to be cut away, and a girder, with a clear span of 70 feet, had to be erected to carry the two roofs, so as to allow of the unimpeded progress of the retort-house operations. The girder over-all is 76 feet long, 5 feet deep, and 2 feet wide. To get it into position, the top part of the partition wall was first taken down; and then the girder was built in on the top of the part which was temporarily left standing for the purpose. The six settings in the coal-store are hand stoked; but the eighteen in the retort-house proper are worked by Arrol-Foulis hydraulic machines.

This brings us to the re-arrangements made in connection with the coal-handling. With the introduction of the hydraulic machines, the hydraulic ram system of discharging the coal-waggons by gravitation was adopted. When the hydraulic machinery was put in, the coal-store occupied the whole length alongside the retort-house, and there was a single line of rails running through it for the passage of the coal-waggons. The system of working then was to pass half-dozen waggons into the coal-stores, reaching from the entrance to the second coal-shoot, where they were discharged. There was room ahead for the empties to travel straight forward; and as these passed onwards, room was made for a further half-dozen waggons to be discharged at the first shoot. But when the six settings were put up in the farther part of the coal-stores from the waggon entrance, the space for empty waggons was cut off. To meet this loss, a second line of rails was laid; and a traverser was put in to transfer the empties on to the second line for despatch from the stores. A hydraulic capstan was also introduced for handling the trucks; the doorways were widened in order to make room for the two roads of rails; and the walls and roof of the coal-store had to be raised about 13 feet. This last part of the work was let to a contractor, who preferred to strip the roof, and take down the principals and re-erect them, rather than, owing to the difficulties, raise the roof bodily, as was done by the Engineer in the case of the retort-house roof.

Now, instead of the hand work of former days, the coal is discharged by gravitation from the waggons down the coal-shoots, is raised by elevators and deposited in hoppers, and is finally fed into the retorts by the Arrol-Foulis machines. The coke is carried from the house by one of the New Conveyor Company's conveyors, and raised to overhead storage hoppers in the coke-yard, from which hoppers it can be loaded by gravitation direct into railway waggons, carts, or sacks. All this work has come into the general scheme of improvement and extension.

Going further into the scheme, it must be mentioned that the extension of the works is entirely in a northerly direction; but the existing plant was in the south corner of the site. Therefore, as the retort-house and purifying plant extensions had to be northwards, the exhausters, to come between the retort-house and the purifying plant, will also have to be moved to a more northern part of the works. It was therefore decided, as larger exhausters would shortly be required for the water-gas plant, to put them into the old house, and use them temporarily on the coal-gas until a new exhauster-house is built next year. Then a whole range of buildings and plant adjacent to the retort-house will come down. There is a steam-boiler to be taken out, a boiler-house to be destroyed, and scrubbers to be taken down. Next year, too, washer-scrubbers (of the Kirkham, Hulett, and Chandler type) will be put into the new portion of the works. The present coal

gas exhausters will then become the water-gas exhausters; and the old water-gas exhausters will also be dismantled.

Still in the old part of the works, another big job that has been carried out is in connection with the two-lift relief holder. It was the oldest gasholder and tank on the works; and it got so silted up, that it was impossible to get either lift properly down on its bed-stones. The lifts were being canted over, and the rollers were breaking away. Besides this, the holder was fitted with only 12-inch inlet and outlet, which were totally inadequate for the large quantity of carburetted water gas that is made on the works. It will be remembered that at these works 50 per cent. of the output is carburetted water gas; so that this gas is not merely used as an enricher, but as a bulk producer, and—be it noted—now, and for some time past, has been made at a cheaper rate per 1000 feet than coal gas. However, the holder was thoroughly overhauled; and the small inlet and outlet were replaced by a 30-inch inlet and a 24-inch outlet. The reason for putting a larger inlet than outlet is obvious. The gas is made intermittently, but it leaves the holder in an even stream; so that a pipe of greater dimensions is required for the inlet than the outlet, in order to provide for the large bulk that is intermittently poured into the holder. In re-piping this holder, it was also necessary to run a 30-inch main from the water-gas plant (which is situated fully 200 yards away); and this main had to be brought right through the whole of the existing works. Hard by the relief-holder are seen the old workshops and pump-house. The latter is merely a structure of galvanized iron; and the former are small and unsuitable for the amount of work produced by the present large business. All these buildings are doomed: and, as we shall see, new spacious buildings are already well advanced for workshops, and a decent building for the pumps has been arranged for.

Reference has been made to the changes, temporary and contemplated, in connection with the exhausting plant; and near to the old workshops is found the exhauster-house, which, as has been explained, is still used for coal gas; but next year it will become the water-gas exhauster-house. It is seen that the remodelling that has been going on here has embraced the taking out of the worn-out exhausters which were belt-driven; the laying down of a new steel joist and concrete floor, in place of the old wooden one; and the walls have been redecorated in a very pleasing style. It is a feature which calls for notice that throughout the newer parts of the works a better style of buildings is now being aimed at; and this is very much encouraged by the Chairman. Here, in fact, we find an important element of Mr. Woodall's administrative policy; and Mr. Broadberry's views have a strong inclination in the same direction. The Chairman believes that the more the surroundings of the workman are improved, the more is his self-respect raised, and the better workman and citizen he becomes. Few will care to gainsay this.

Passing to the boiler-house, it is learned that water-softeners have had to be introduced on account of the hardness of the water, as it was giving a great deal of trouble in the boilers, more particularly in the water-tube ones. In the boiler-house, it is found that the adoption of stoking machinery has necessitated the putting in of two Lancashire boilers, 28 ft. by 7 ft. 6 in. The house formerly contained three Galloway boilers; but one has been removed to the sulphate-house. Two, however, remain; and the addition of the two large Lancashire boilers has necessitated practically the rebuilding of the whole of the house, so as to have the boilers under one roof.

(To be continued.)

SANITATION OF FACTORIES AND WORKSHOPS.

THE annual report of the Chief Inspector of Factories and Workshops is a mine of information relating to many of the matters of professional interest to gas engineers which it is incumbent upon them to know about, which are yet not strictly within their own technic. We have already given prominence to what the Chief Inspector and his Medical Assistants have to say respecting the use of flueless gas heating-stoves in workrooms; and it is important to follow up the observations of the inspectors on the other conditions which affect the ventilation of workshops, such as the amount of space provided, and the means of lighting employed. One of the subjects mentioned is the use of gas-heated tools. This is discussed in the Lady Inspectors' report. It is very expedient that manufacturers of gas smoothing irons and other laundry appliances should give heed to what these Inspectors say about their productions.

Miss Vines specifically illustrates the tendency of modern laundry work by giving the history of a workshop in which there were only six women and girls employed. Under old conditions the room would have been a workshop; but the introduction of a $\frac{1}{6}$th-horse power electric motor for driving the sewing machine converted the premises into a factory. The one iron in use was likewise heated by electricity, and the room was lit by electric light. "The superiority of electricity to gas for lighting purposes is patent, and perhaps the greatest benefit of all is the heating of irons by this means. Some of the most frequent sources of danger to health in tailoring and dressmaking workshops are defective fittings to an unventilated or insufficiently ventilated gas iron-heater. . . . I was most glad to hear the other day in one of our largest West London laundries that it was proposed in the near future there to substitute electric for gas irons." Cases of injury to health from defective gas-irons were reported by Miss Vines; and proceedings were instituted against the employer in one especially bad case. Conviction followed, and the special penalty imposed is to be applied, by the sanction of the Secretary of State, to the benefit of the injured worker.

Laundries in which gas-irons are used receive attention from the Inspectors under special rules applying to dangerous and injurious processes. The Principal Lady Inspector, Dr. A. Mary Anderson, remarks that it becomes yearly clearer that defective gas ironing machinery forms a growing risk in a trade which extends so rapidly and easily in the hands of ignorant, untrained "occupiers." Miss Deane remarks that the large amount of gas which is used in laundries for heating purposes is likely to be pernicious to health unless great care is taken to insure that the fittings are in proper repair and that a good and wholesome type of machine is used. The supervision of laundries occupies an extraordinary amount of the Lady Inspectors' time.

On the whole, the efforts of the Inspectors are making headway. It has long been recognized that the dust generated and given off in manufacturing processes constitutes one of the chief dangers to the health of the workers. Difficulty is experienced in persuading employers and workpeople of the necessity of suppressing all kinds of factory dust. For instance, the stove grate trade, including gas-stoves, makes much dust through the use of grinding wheels. Much trouble has been met in providing a remedy for this; but the difficulty has now been generally overcome. Cases of "gassing" come under the notice of the Inspectors, and constitute a most distressing class of industrial accidents. Mr. Harston reported with highly interesting detail a very serious accident of this kind which occurred at a portland cement works near Rochester. In this instance, carbon monoxide was the agent which caused the death of a foreman and two workmen, while several others were revived only with much difficulty. The circumstances were very extraordinary.

Mr. Harston also records the remarkable and unique fatality in a subway of a gas retort-house, which still remains a mystery. The same Inspector has something to say about gas-engine bags. The explosion of such a bag, on a Dowson gas-engine, killed the attendant by reason, it appears, of the action of the insurance company in requiring the bag to be encased in sheet iron. An explosive mixture had got into the bag through the machinery having been standing for a fortnight for repairs. As Mr. Harston observes, the liability to such an accident does not appear to be a great one; but the expediency of encasing the bags with sheet-iron covers would appear to be a doubtful one. But for this, the mere explosion of an india-rubber bag would not be a serious matter. Mr. Owner also reports a gas-engine explosion, which was due to the peculiarity that the air supply to the cylinder was drawn from the hollow frame of the engine bed. An explosive mixture leaked back and fired. It was an old-pattern engine.

As usual, the Inspectors complain of the trouble they experience in getting gas-engines and all kinds of moving machinery safely fenced, and in procuring obedience by workpeople to regulations conceived for their protection. One of the sources of difficulty here, on both sides, is sheer ignorance of the correlation of theory and practice. Sometimes it is heedlessness, as in the case of a firm prosecuted and substantially fined for allowing several gas-engines in a new factory to run for six weeks unfenced. As against this may be set the statement that makers of laundry machinery are giving more attention to the provision of safety fittings for the prevention of accidents. Attention is drawn to the fact that blocking the approach to a dangerous machine is not the same as fencing it. Stress is laid upon the danger of starting gas-engines by pulling round the fly-wheel by hand, which in practice often gets done by a boy or girl. The ancient trouble of getting workpeople to wash their hands before partaking of their meals, &c., is again brought forward.

Perusal of the reports of the individual Inspectors furnishes some interesting indications of the incessant alteration of the course of industry with the times. Thus the manufacture of incandescent gas-burner mantles has attracted the attention of Miss Squire, who has paid numerous visits to London factories of this order, to investigate the effect on health and safety of the conditions of work. The intense heat and glare of certain phases of this manufacture are noticed. Miss Squire testifies from personal experience to "the extreme discomfort caused by inhaling the smoke and fumes, and the painful effect upon the eyes, lasting for many hours after leaving the works." Various remedial measures have been proposed to the employers and received without objection. The matter is to be more fully reported on next year; the industry being an increasing one. It is a far cry from the making of incandescent mantles to the sifting and sorting of dust-bin refuse; but both afford employment for women, and both are connected more or less with the gas industry. For it is reported by Miss Martindale that the employment of women in refuse-sorting is rapidly decreasing, partly owing to the extensive use of gas-stoves, by reason of which the amount of the cinders (which is the valuable constituent in refuse) has decreased so that it no longer pays to sift and sort the refuse by hand.

On the general question of the adequate ventilation of thickly occupied interiors, Dr. Whitelegge remarks that while the standard must be selected arbitrarily, by common consent the proportion of carbonic acid is accepted as the most convenient measure

of impurity when this ingredient is contributed by respiration and the products of combustion. In general, the observation of M. Chaumont, that, to a person entering from the open air, the atmosphere of a room appears "close" if the respiratory impurity is such that the proportion of carbonic acid exceeds 6 per 10,000 volumes, has been taken as the basis of ventilation as it should be. Estimating the hourly yield of respiratory carbonic acid as 0·6 cubic foot per head, and the proportion of carbonic acid in outside air as 4 per 10,000, it follows that every 1000 cubic feet of fresh air can take up 0·2 cubic foot of carbonic acid without exceeding this datum; and hence that 3000 cubic feet of fresh air per head per hour, if uniformly diffused, will keep the respiratory carbonic acid down to that limit. The further observation that the whole of the air of a room at ordinary temperatures can be changed about three times an hour without causing inconvenient draught, has led to the further datum of 1000 cubic feet of air space as the proper provision for each person if the respiratory carbonic acid is to be kept down to 6 per 10,000 by an hourly delivery of 3000 cubic feet of fresh air.

It follows from these data of ventilation that air space in an interior should be regarded rather as a means of allowing ventilation without draught than as an end in itself; and experience shows that some of the worst examples of impurity of air are found in large rooms with ample air space per head, but wanting in the essential of ventilation. In small rooms, too, the diffusion of air through walls, ceilings, and floors, which surfaces are in larger proportion to the cubic contents than in larger rooms, tends to lessen the impurity. Further, the only useful part of the air space is that which lends itself to ventilation; stagnant corners and recesses, and parts remote in height or even in length, count for very little. Hence, in some of the special rules for dangerous trades, a requirement of certain air space per head is coupled with a condition that, in measuring it, that which is over a certain height from the floor shall be disregarded. Another reason for the limitation is to secure floor space. These data of ventilation are of importance, not for workshops or factories only.

Dr. Whitelegge refers to the work to the Departmental Committee on Ventilation in 1900, which reported in 1902, as noticed in the "JOURNAL" at the time. The recommendations of this Committee with regard to the prescription of a direct carbonic acid standard of air purity for workshops and factories generally are collated here with the orders now in force. Dr. Haldane's testing apparatus for use by the Inspectors, mentioned in the report, is now being subjected to extended trial in the department. The whole matter is stated to be "receiving the careful consideration which its importance demands"—the official way of saying that nothing is yet settled in this regard. One cannot help thinking that the question of proper ventilation will not be answered until somebody produces a simple and reliable indicator of the condition of the atmosphere of interiors which can be used to convince the most sceptical.

ELECTRIC LIGHTING MEMORANDA.

Bad Times for Electrical Engineering Firms—The Collapse of the Ferranti Company—Unfortunate Business at Cheltenham—A Hopeless Awakening—Prudent Ramsgate.

NOTWITHSTANDING the bold front which electricians habitually, and very creditably, put upon their financial affairs, indications are not wanting that the electrical engineering trade, at any rate, does not now pay very well. This is accounted for in many ways. It is well known that this branch of electrical industry was in low water for a considerable time, some few years ago—before, that is to say, the beginning of the movement for the electrifying of the tramways and suburban railways. This movement revived the trade for a year or two, beginning in 1900; but its value for the manufacturers has almost become exhausted already. The worst of it is, that during this transient "boom" the British electrical manufacturing firms increased their capital enormously, to cope with the rush of orders; and now the wave has passed and left many of them high and dry, with huge works and no money. The figures relating to this phase of electrical trading contributed by Mr. William Pollard Digby to the "Electrician," leave no room for doubt as to what has been going on. In 1898 there were 62 electrical manufacturing firms in this country, with an aggregate capital of 10½ millions. By 1902 the number of firms in the trade had risen to 160, and the capital employed to 30 millions. What did these firms find to do? Not much in the export line, of course. The export trade steadily rose, but never attained the magnitude of the imports. On the whole, notwithstanding certain indications of "dumping" from abroad in 1900 and the following year, when the Germans were trying to turn their surplus goods into cash, the products of these firms seem to have been fairly well absorbed by the home demand. But, as usual, it was overdone. Nearly all the big construction companies' shares are quoted at about half-price.

It is impossible for outsiders to observe without a feeling of regret that the Ferranti Company have come to grief. A meeting of the creditors of this unfortunate concern, was held the week before last, which resulted in the appointment of a Committee of ten to confer with the Directors and the debenture holders with the object of saving as much of the property as can be pulled out of the fire. The works at Hollinwood are actually being carried on by a Receiver, with the aid of borrowed money for paying wages and carrying out contracts in hand. Roughly, the position of affairs is represented to be that the £100,000 of ordinary shares are out of it in any event. On a forced liquidation, the debenture holders and secured creditors would come out all right; but there would not be much over. The works have been specialized for engines, alternators, switch-gear, and meters. There does not appear to be money in engine building, and this has been dropped for some time. The idea of the shareholders' representatives is reported to be to abandon the Ferranti alternator also, and concentrate on the two lighter branches, in which there is a considerable trade. The difficulties of the firm seem to have partly arisen from taking contracts from local authorities who only pay 80 per cent. on certificates of work completed. The Company had not sufficient capital to carry on upon these terms. Other firms suffer in the same way; and it is an agreed thing among them that municipal contracts are not worth having at the current prices. Yet the constructing firms dare not refuse them, for there is little else going; and they cannot put up their prices for fear of the foreigner, who will "chip in" on the smallest inducement.

There appears to be much heart-searching at Cheltenham in regard to the finances of the Borough Electric Lighting Department. The immediate outcome of this uneasiness is the presentation to the Corporation, by the Electrical Engineer, of the most elaborate report on the financial aspect of the undertaking, that has ever seen the light in such a connection. The case is grave. The broad facts are that, after seven years' working, the Corporation electricity supply undertaking is still losing money on the face of the revenue account at the rate of nearly £4000 a year. The deficiency on the last year's working was £2966, which is an increasing amount; the debit balance for the previous year being £2791. The gross deficiency on the revenue accounts to date amounts to £17,128; and very naturally the Town Council want to know the reason for it. The most potent one is that the undertaken cannot get enough business to pay its way. Everybody knows why. Cheltenham gas is among the cheapest in the country, and the supply is thoroughly well done in every respect. This fact, of course, is not stated in the official report. That something is out of joint in the concern might be inferred from the circumstance that it was only possible last year to sell 662,675 units to private consumers, who paid £8419 for the supply; whereas the Corporation took 617,227 units for public lighting, and 235,340 units went for traction. The Engineer admits that the public lighting is done at less than cost price, and the public library has been lit on the same principle. This is a very fair example of feeding a dog with his own tail.

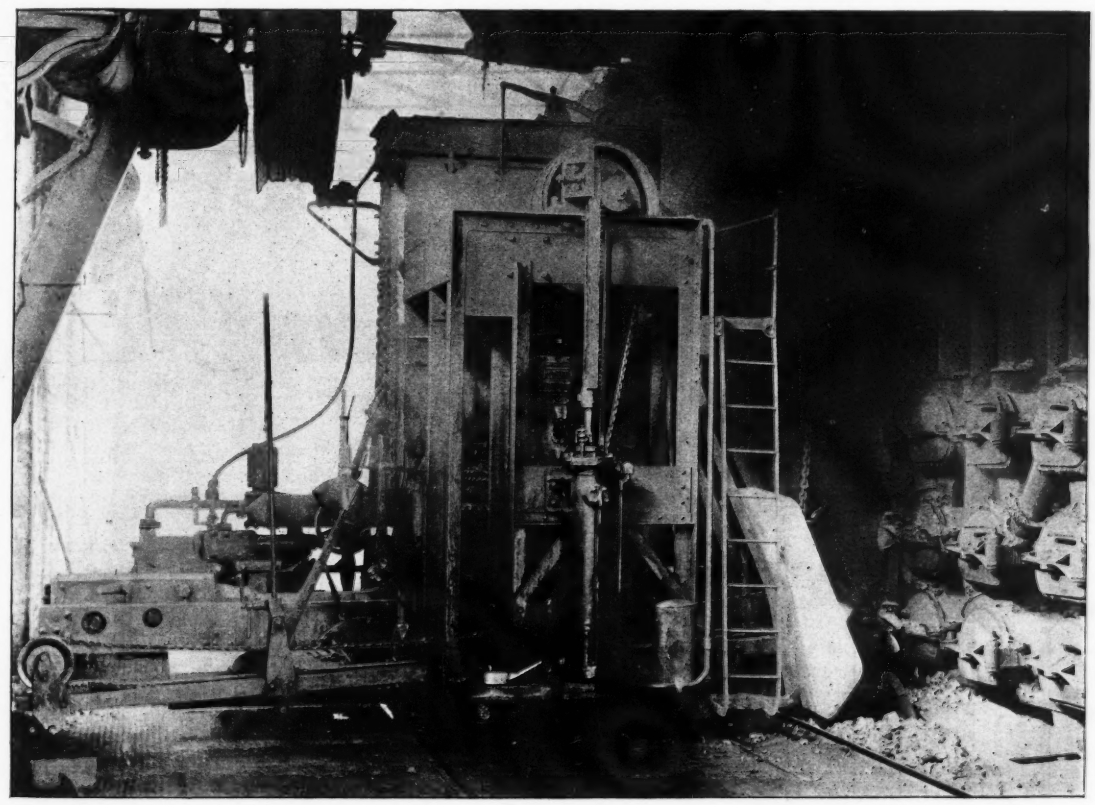
It is remarked that the disgusted ratepayers have been levelling charges of mismanagement and extravagance at the management of the Cheltenham undertaking, through not understanding why the concern has never paid. These signs of dissatisfaction are only natural in the circumstances; and it is to be feared that the Engineer's elaborate explanation, which no ordinary ratepayer could possibly understand, will leave popular feeling in regard to the matter precisely as it was before. No amount of explanation can avail to remove the annual drafts upon the rate fund to keep the undertaking going; and these are the facts that matter. We notice that it is proposed to increase the charge for the public lamps, which is only giving the dog a little more of its tail. Then the private consumers are also to be tickled some more with an adjustment of the famous maximum demand system of charging; but inasmuch as they do not understand the system as it is, it is at least questionable how far a fresh juggle with first-hour and follow-on prices will avail to extract more patronage for the dearest light in the town. The long and the short of it is that the Corporation are saddled with a losing concern; and the sooner the truth is recognized the better. Not that recognition will make much difference to the ratepayers; but the latter might as well realize the extent of the subsidy which they contribute, in one shape and another, so as to keep the Corporation undertaking going. There is nothing wrong apparently with the management. The works costs and the capital expenditure are quite within the bounds of reason; but there is no trade, or not nearly enough. It may be, and probably is, good in a way for Cheltenham to have electric lighting. It is the kind of thing that visitors would look for. The mistake of the Corporation has been in setting up too big an establishment for the purpose of affording the supply, and then in squandering so much money on the public lighting. We had almost forgotten the traction load, which is already more than half the private lighting sales; but as this, like all other connections of the kind, has to be done at an unremunerative price, it is not much good to the concern as a whole.

Ramsgate is an example of a Corporation who, after having gone into the matter of electric lighting with a view to doing the work themselves, have decided to let a private Company provide the service on agreed terms. Really, there were two tenderers for the contract—the Tramway Company and an Electric Lighting Company. Both offered maximum demand rates—the former of 6½d. for the first hour and 2d. per unit to follow, and the latter 7d. and 3d. per unit under the same conditions. The Corporation favour the latter, for some reason which has not transpired, though the difference of cost is considerable to the users of current. It is to be hoped that the consumers of electricity in Ramsgate will understand their bills; but, in any case, this is a matter in which their interest as ratepayers will not be involved.

FROM ORWELL TO COKE HEAP OR WAGGON.

Just twelve months ago, it was our pleasure to publish an illustrated description of the extensive coal-storing plant which had been installed at the works of the Ipswich Gas Company, and by which the coal was raised from the holds of the steamers conveying it by way of the River Orwell to the works, automatically weighed, placed on a transverse reversible conveyor, and thence transferred to longitudinal conveyors running through the coal-stores flanking No. 1 retort-house. That was only the beginning of a large scheme which the Company's Engineer (Mr. J. T. Jolliffe) had in view for lightening the labour and reducing the expense per ton of dealing with the ever-growing quantity of raw and spent material which the increasing gas consumption demands and produces. The descriptive article of twelve months ago carried us to the placing of the coal into store; to-day the coal may be seen charged into the retorts in No. 1 house, and the spent charges removed from them, by the first installation that has been made in this country of the West's Gas Improvement Company's new combined charging and discharging machine, and then the coke carried from the house, and stored or loaded for removal by a large conveying plant that has been laid down by the New Conveyor Company. Thus from Orwell to coke heap or into cart and (a little later) into railway waggons, the main incoming and outgoing materials of manufacture are dealt with without any manual labour, and with only the exercise of that higher intelligence which the attention to, and the direction of, machinery of any kind demands of the men. Therefore, while the increase of business is now being met, and can to a still larger extent be met in the future, without any addition to labour, and at a saving to the Company per ton of shifted material, the men have been given, first, relief from the exhausting part of the work as formerly conducted, and, secondly, work and responsibility of a character that cannot fail to increase their interest and impart fresh life to their mental faculties. In this, there is a value to the Company which, though not capable of being measured in money, has its profitable side. We have no doubt, too, that Mr. Jolliffe and his Chief Assistant (Mr. Frank Prentice) would be prepared to attest the greater comfort and assurance which they enjoy as a consequence.

Before passing to the description of the new plant, it may be of interest to remark that the good opinion formed by the Engineer of the coal plant from his short experience at the time the reference to it appeared in these columns twelve months since, has been confirmed in the meantime. The boats which traverse the Orwell to the works have a burthen of from 700 to 1000 tons. To discharge these under the old conditions absorbed something like twenty-four hours per boat. Now a cargo can be lodged in store,



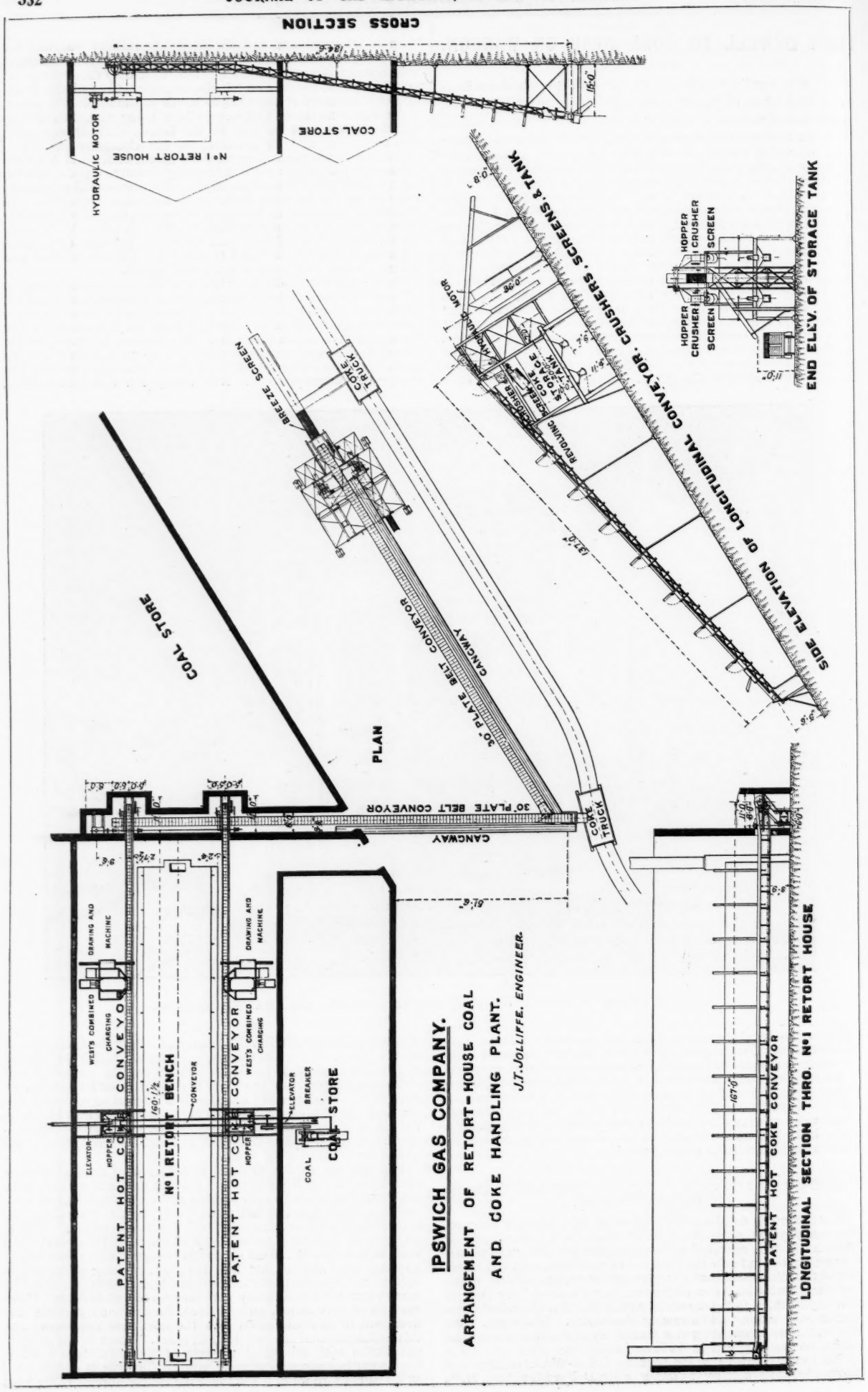
The First Installation of West's Combined Charging and Drawing Machine.

according to the tonnage, in from nine to twelve hours. This means that the Company are able to buy cheaper delivered on to the works, as boats are released and tides saved that were lost under the former circumstances; and the saving effected in transferring the coal from boat to store is equal on an average to from 5½d. to 6d. per ton. This coal-storing plant [for particulars of which reference must be made to the article of twelve months since] is looked upon at Ipswich as an excellent combination, which has given relief in several ways.

The First Installation of West's Combined Charging and Drawing Machine.

Now we come to the continuation of Mr. Jolliffe's scheme. For many years until the present one, No. 1 retort-house at Ipswich has been operated by West's manual drawing and charging machines; and now the works take precedence in the adoption of the West combined charging and drawing machine, which was described with some fulness in the "Journal" for Dec. 16 last. Ipswich, in fact, may claim something of a historical association with stoking and drawing machinery. When Mr. West first started experimenting with machinery at the Maidstone Gas-works, he was assisted in its introduction into other gas-works by Mr. James Eldridge, at the Richmond Gas-Works in 1876, and also in 1877 at Ipswich by the father of Mr. D. Ford Goddard, M.P., who was subsequently the Engineer, and is now the Chairman, of the Company. Therefore the Engineer of the Ipswich Gas-Works of 26 years since was one of the first to see the advantages of stoking machinery, and to render first aid in what has proved its remarkable development; and now it is interesting to record that the Engineer of to-day at Ipswich is the first to get into his works the latest of the many inventions of Mr. John West—the combined charging and drawing machine which he has specially designed for medium-sized works.

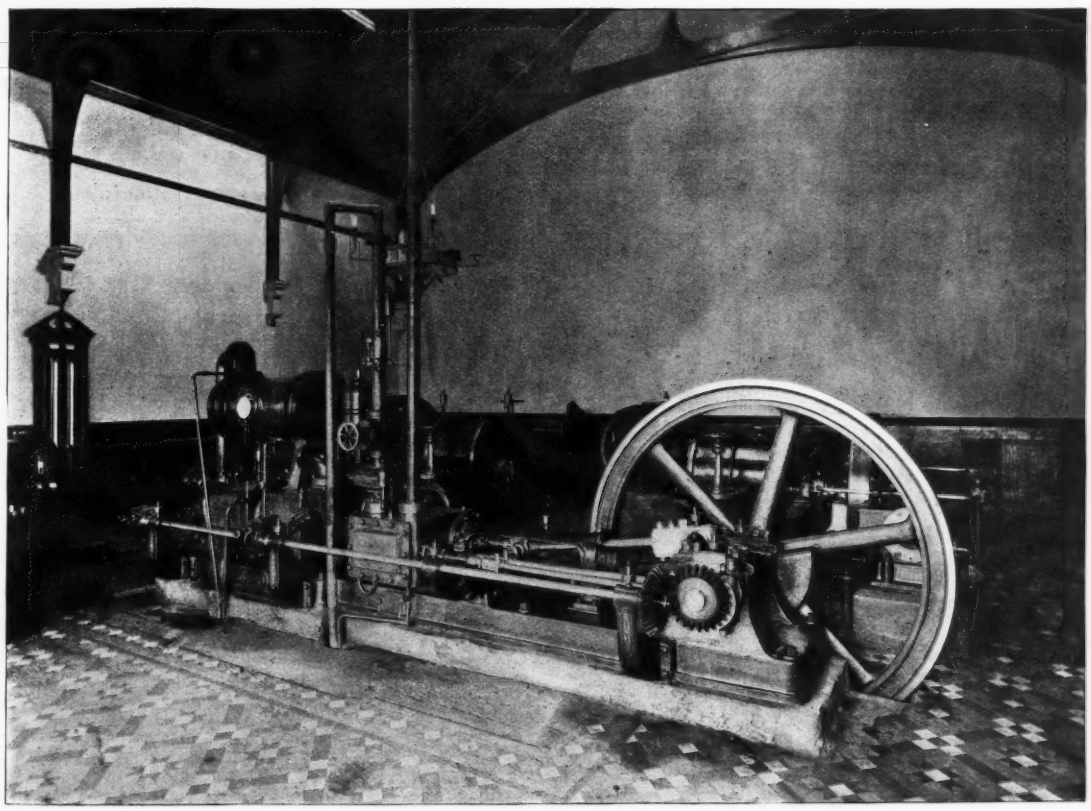
The allusion to the original installation of manual stoking machinery in the No. 1 house at Ipswich reminds us that, with the exception of a new coal breaker and elevator, the same coal-handling plant that was laid down in 1877 by the West Company is now doing duty in connection with the new machines. This is an excellent testimony to the honest character of the material and work with which Mr. West set out in business in this line nearly 30 years ago; and the fact that the plant is being continued in service in connection with the new machines shows that it will be many years yet before every part reaches the scrap-heap. However, as already noted, an additional breaker and elevator has been put in in conjunction with the combined machines; and this has duplicated the coal-feeding plant. There is one point in connection with this plant wherein at the initial stage it differs from what is customary at most works. Trouble is experienced at the works with water; and therefore the coal-breakers are fixed


CROSS SECTION
HYDRAULIC MOTOR
No 1 RETORT HOUSE
COAL STORE
SIDE ELEVATION OF LONGITUDINAL CONVEYOR. CRUSHERS. SCREENS. & TANK
HOPPER
CRUSHER
SCREEN
END ELEV. OF STORAGE TANK
BREEZE SCREEN
COKE TRUCK
REVOLVING
STORAGE TANK
30" PLATE BELT CONVEYOR
CANCWAY
PLAN
COAL STORE
30" PLATE BELT CONVEYOR
CANCWAY
COKE TRUCK
PATENT HOT COKE CONVEYOR
No 1 RETORT BENCH
PATENT HOT COKE CONVEYOR
COAL STORE
IPSWICH GAS COMPANY.
ARRANGEMENT OF RETORT-HOUSE COAL AND COKE HANDLING PLANT.
J.T. JOLLIFFE. ENGINEER.
LONGITUDINAL SECTION THRO. No 1 RETORT HOUSE
PATENT HOT COKE CONVEYOR

above the ground-level of the coal-stores, being fed by a short length of elevator. From the breakers, the coal is elevated to the overhead hoppers in the retort-house in the ordinary way. A cross-conveyor between the two elevator heads carries the coal to the centralized hoppers; and this conveyor being reversible, either section of the coal plant can be thrown out of action at will. The hoppers have a capacity of 10 tons each; so that there is a total storage in the house of 20 tons.

While dealing with the coal-feeding arrangements, there is a matter which can be conveniently mentioned here; and, so far as we are aware, Ipswich is unique in this respect. Quite a keenness is shown in regard to having the exact quantity of coal charged into the retorts, and in keeping an accurate register of the weight of all the coal put into the hoppers of the machines. The machine hoppers by the way have a capacity of 55 cwt. Under the overhead hoppers on either side of the house, and forming part of the stage-floors, is a weighbridge, and on to this the charging-machine must be brought every time it is fed with coal; so that the precise amount of coal passed into the machine hopper each time throughout a charge is registered, and the total quantity of coal put into the retorts during a charge, shift, day, or any other period is known to a nicety. The weighbridges are of Messrs. Hodgson and Stead's make. The steelyards are situated in the central passage through the retort-benches; and there the coal-runner weighs the coal (the weight of the machine being deducted), and notes it on a sheet, from which it is afterwards entered into a book. The coal-runner is careful not to delegate this duty to anyone else, because it would be an easy thing for the stokers to "knock off" a few hundredweight of coal to his detriment. This system of weighing the coal carbonized was employed with the old manual machines; and it has been found most accurate and useful. Not only does it keep a check on the coal used, but it is a check on the men. Besides this, it is an advantage to the men in that it is an independent record of the faithful discharge of their duties. The idea has commended itself to several engineers who have seen it at Ipswich; but, so far as we are aware, they have been slow to adopt it.

This brings us to the new combined charging and drawing machines, of which, of course, there is one on each side of the house. The drawing and charging arrangements and mechanism are on the one carriage, and the drawing and charging operations of the machine are controlled by one attendant. This point of the labour required will be enlarged upon presently. The published description of the new machine previously referred to stands without emendation, excepting in one particular. The Ipswich machines are fitted with recently patented automatic gear for reversing the scoop from the one direction to the other without any attention on the part of the machine attendant, who



The Air-Compressing Plant for the New Combined Stoking-Machines.

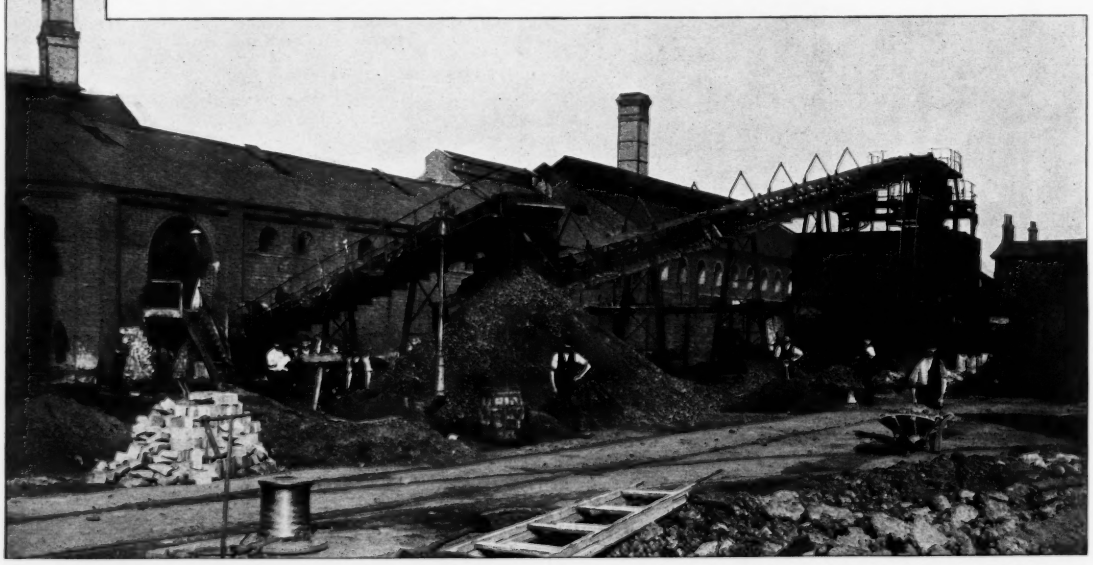
formerly had for this purpose to operate a lever on the charger every time, or previous to, the scoop entering the retort. The machines are driven by compressed air; and the compressor is located in the exhauster-house across the yard. It is found to be of a new type, specially designed by the West Company for working with the combined type of machine. The motive power is provided by a steam-engine combined with the compressor. The steam cylinder is fitted with an adjustable cut-off expansion valve; and the air-cylinders are provided with suction and delivery valves mechanically operated. The air is compressed in two stages; and there is an intermediate cooler for cooling down the air between the stages. This is the type of compressor that the firm intend to generally make in the future. It is of strong construction; and its performance can only be described as excellent. From the indicator diagrams taken, an efficiency of 80 per cent. is shown; and this is an efficiency above the average of air-compressing plants. From the exhauster-house, the air is conducted by pipes to overhead automatically worked drums in the retort-house, on which drums are wound the flexible tubing by which the compressed air is transmitted to the machines. The arrangement dispenses with any attention on the part of the stokers in the way of connecting up the supply of compressed air.

In giving an explanatory account of the work accomplished by this first installation of the combined charging and drawing machine, it is necessary to especially state one particular in which the house itself acts as a deterrent to the attaining of the highest efficiency from the machines in respect of the labour employed. It is a retort-house of many years' service; and when it was designed, it was not contemplated that power stoking machinery of this type would ever find place within it. The house is only 60 feet wide; so that, with a bench of 20 feet through retorts running down it centrally, the stage-floors are only 20 feet wide. This necessitates the machines running quite close to the retort-mouthpieces; and it leaves barely sufficient passage way for the men at the back. Therefore both the machines and the men are cramped for working room; and consequently the best conditions for gaining the highest degree of efficiency with the machines are not found in this house, as will be seen shortly. The house contains twelve beds of nine through retorts of Ω section—16 in. by 21½ in. by 20 feet. The settings have producers on one side only; and it was incidentally noticed that the firing-holes are not provided with lids. Instead, after the producers have been charged with coke, the holes are sealed up with spent-lime joints, which bake hard and solid, and effectually prevent any injurious ingress of air at this point. On the occasion of the visit, it was remarked that the heats of the retorts were splendid; and it was learnt that the weight of charge then being put in by each machine was 3¾ cwt., or 7½ cwt. in each through retort.

The new machines have been at work too short a period for

any precise figures to be given; but it is easy to indicate in what respect, from present experiences, the working will show a considerable improvement upon that of the old manual machines. In the first place, as to the labour. It has been pointed out by Mr. West that two men, with one of these combined machines, should be capable of doing the whole work of charging and drawing in a house coming within the scope of this type of machine; and there is little doubt from what is seen at Ipswich that, given a retort-house with more working space on the stages for the men, Mr. West has not at all exaggerated the capabilities of his machine in this respect. But here the confined conditions necessitate the employment of a third man, to avoid the delay which the dodging round the machine to get from one side to the other would occasion. The machines, of course, work to the best advantage in point of labour results where there is the greatest scope. But even so, at Ipswich there is a tremendous saving in the number of men required for dealing with the house; and we do not see that there is any great benefit in cutting down too finely the number of men who have part in the working of the machines, in a house of the size of this one, as there are several other duties which they can perform. The final test is the total reduction which the changed conditions will effect in the operation of a house. Three men here form a gang for each stage. They are all trained to work the machine, and take turns at it. This is a matter that Mr. Jolliffe has insisted upon—that every man on the stage should be a qualified machine attendant, and not a mere opener and closer of lids and augerer of pipes. Besides drawing and charging the retorts, their duties include the filling of the furnaces, auguring the pipes, cleaning and oiling their machines, and any other work that the interior of the house provides. The men work twelve-hour shifts; and the charges are six-hour ones. Each gang can draw and charge the whole of the twelve beds of nine retorts; and if there were a few more beds—even up to fifteen or sixteen we may perhaps say—they would be able to deal with them as well. Now what has been the total effect of the new machinery in the matter of labour? For the twelve beds of nines, with the manual machines 38 men were employed in the house per day; and this represented a saving over hand work. Now 18 men are equal, with the two combined power machines, to working the entire house—in other words, there is here a saving of 20 men per day!

Speaking generally of the working, Mr. Jolliffe is delighted with the operation of the machines, though they are not working quite up to the notions and experiences of the Contractors in respect of speed. But then the men are comparatively new at the work. Time will make them more skilful in handling the machines; and it must not be forgotten that freedom in operation must be, and is, curtailed by the cramped conditions under which work is pursued. Now beyond the saving already credited to the machines, since they were put into operation, a good general improvement has manifested itself in the working. The dual work of drawing and charging is done by one man with the ease, if not quite with the celerity, of long-practised hands with the separate machines. In reply to inquiries as to what they thought of the character of the charges, Mr. Jolliffe and Mr. Prentice describe them as having been vastly improved—to, in fact, the degree of perfection. It is also anticipated, judged by the present success, that when the house is in full work (only eight beds at the time of the visit were in use) that the average production will be equal to 8000 cubic feet per mouthpiece in twenty-four hours, as compared with 6600 cubic feet under the old working in the days of the manual machines. Heats and charges have been increased. There has, furthermore, been almost complete freedom from blocked pipes since the machines have been in operation. There are occasional ones, and that is all; but the changed condition in this respect is put down to the increased and improved charges. It was also remarked that the combined machine does not take up so much room in the house as would separate machines; and this enables it to charge retorts near the end wall, which is a great advantage in houses of restricted dimensions. Making this comparison, too, suggests that the reduction of the number of men required as compared with the separate machines is a noteworthy point.



The New Coke-Conveying Plant at the Ipswich Gas-Works.

Altogether at Ipswich it may be said that the engineering staff and the men are very pleased with the new machines. They form the last stage in the march of improvement that has raised the productive capacity of this retort-house from what it was originally designed for by Mr. Goddard—viz., 1,250,000 cubic feet per day—to (to put it well under the mark) 1,850,000 cubic feet. The difference between the lower and the higher figure is the result of improvement in settings and the adoption of the new machines; and it represents a large saving in capital expenditure in the construction of additional producing plant and in house accommodation. The various advantages which are attributable to the machines are set out here only to the length that it is possible to go at the present time. That they will make an important advance in the economical and efficient conduct of the manufacturing operations, has been abundantly manifested; but it is yet too early to say what the total monetary effect will be. That it will not be inconsiderable is obvious, when all the benefits are taken into account.

The New Coke-Conveying Plant.

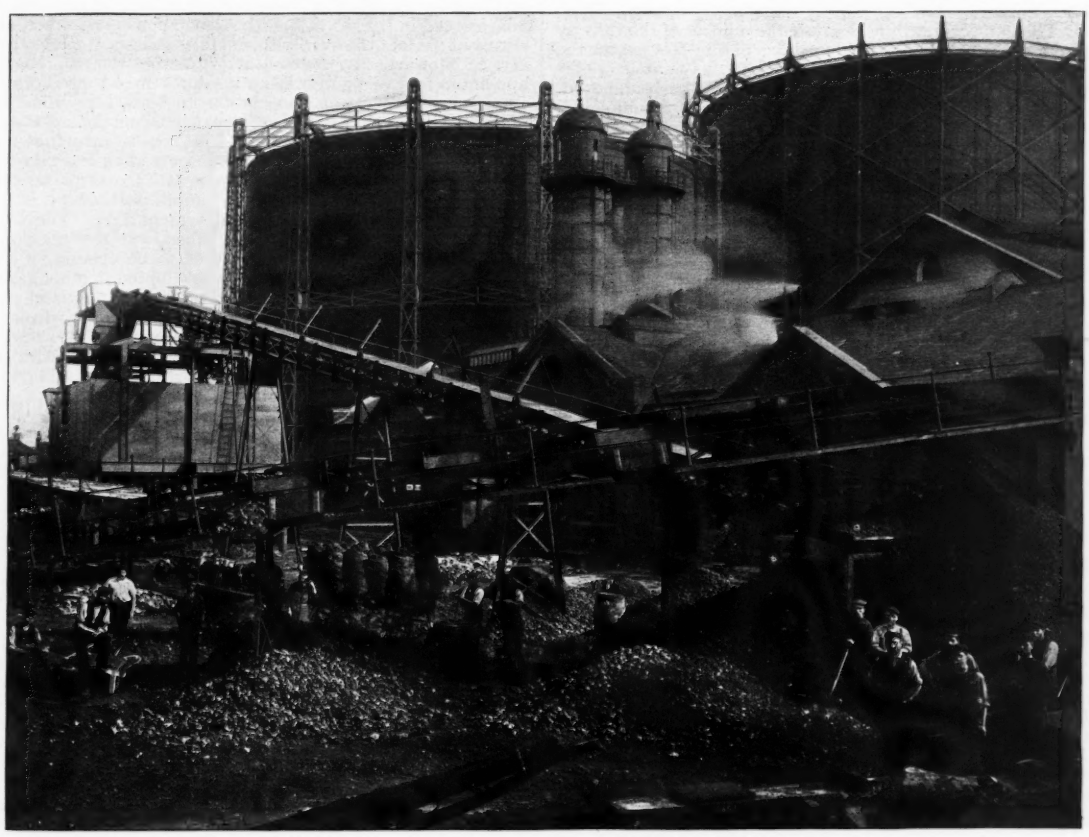
But to complete the passage of the coal through the stages of its conversion and away in the form of coke to the yard without manual labour, we have now to deal with the extensive new coke plant, which has been installed by the New Conveyor Company, Limited. The hot-coke conveyors on either side of the bench are identical in construction; and therefore one description will suffice for the two. Each conveyor is 168 feet centres and 1 ft. 6 in. wide; being level in front of the bench, and slightly raised at both ends, in order to maintain the water-seals. They are of Messrs. G. & A. Little's patent design, made in the old style, with flat-plates, mounted on a patent single stamped steel bushed chain, which is propelled along a water-tight trough. This is made up of channel sides, and a ⅛-inch plate bottom. The hot coke falling on to the plates is simply carried to the driving end of the conveyor. The top strand is supported by manganese rollers, working on pins attached to each side of every third plate, or, in other words, at 3 feet pitch. Occasional brackets are fixed to the underside of the plates; and these agitate the water, and keep from accumulating the dust that passes between the plates and sides of the trough, and finally deliver it into a barrow through a short dirt conveyor, fitted at the end of each hot-coke conveyor. The return strand is carried by 6-inch diameter rollers, running in bearings (spaced 4 feet apart) fixed to the framework of the conveyor. These bearings are provided with special lubricators for working over long periods without requiring attention.

The trough of the conveyor is placed on the floor girders—the top being slightly above the stage-floor; and the return angles are underneath the girders, so as to give plenty of room on the

ground-floor to allow the clinkering operations being carried on. The water in the trough is maintained level with the plates; and the final quenching of the coke is accomplished by sprays at the conveyor outlet. These sprays are automatically operated—delivery of water only taking place while the coke is passing along the conveyor. The quantity can be regulated to extinguish all fire in the coke, leaving just sufficient heat to evaporate the excess water, and so deliver the coke large and dry to the cross conveyor. It is difficult to see how, in this particular house, the coke could otherwise be dealt with than by a conveyor, now that the power stoking machines are at work.

Following the coke from the house, the two conveyors deliver on to shoots which feed the cross conveyor running outside the end of the house. This conveyor, which is 136 feet long, carries the coke well out into the yard, as will be seen by consulting the plan. The conveyor varies somewhat in design from the two hot-coke ones already described. The plates, which are 30 inches wide, are mounted on a patent steel chain, and are carried on rollers attached to each side of every third plate; and these are fastened on in such a way that they also serve to support the return-strand. With this improved arrangement (which forms one of the features of Mr. A. Little's new patent hot-coke conveyor), there is no switchback motion on the return strand between the fixed rollers that were used with the old form of conveyor, as the rollers run along angle-irons, and the chain links maintain one position throughout, excepting when passing round the end wheels. It will be inferred from this that there is little wear upon the chain pins or bushes. For the first length of 33 ft. 9 in., the cross conveyor is horizontal; and then it inclines upwards until the end shaft is 15 feet from the ground level. In this inclined part of the conveyor, five ploughs have been fixed, to direct the coke to the yard. The framework of the conveyor is made up of 4 in. by 3 in. channels as bases and uprights, 3 in. by 3 in. longitudinal angles, with 1½-inch wearing strips for the rollers. There are 1½-inch latticed bracing bars on each upright; and ½-inch guide-shoots are fixed where the ploughs are situated, in order to keep the coke from falling on to the return belt. The ploughs are ⅜-inch thick and 6 inches deep, and each is supplied with an adjustable plate to take up the wear. The supports for the inclined part of the conveyor consist of structures made up of 6 in. by 3½ in. channel uprights, 2½-inch cross bracing bars, and 2-inch lattice bars. The channels on the under side of the conveyor are extended to carry a wooden platform.

From this last described conveyor, delivery can also be made on to a similar conveyor extending up the yard; so that the coke can be stored anywhere on the available ground space. This conveyor is 137 feet centres, and of the same construction as the one with which we have just been dealing; but it gradually rises



A View of the Coke Distributing and Loading Plant, from the Opposite Side.

to an elevation of 36 feet. It is provided with eight ploughs, seven of which deliver into the yard, and the eighth directs the coke into the crushers. The shafts for driving these conveyors are 4 inches in diameter; the end shafts 4½ inches; the end wheels being of steel, 2 feet pitch diameter.

At the end of the yard conveyor are situated the coke screening and storage part of the plant. The coke, which is broken by the two crushers, is fed through screens into a large hopper, divided into four bays, each measuring 12 ft. by 10 ft. The depth of each is 10 feet, with a hoppered bottom extension 3 feet deep—each being provided with a radial cut-off door of the design that was described when we gave an account of the water-gas plant at Smethwick. Two of the hoppers are bisected by an angle-plate, which takes the "small" delivered through the plates on the revolving screen, and holds it until a sufficient quantity is stored for delivery to carts through side shoots also provided with radial cut-off doors. The capacity of the hoppers is 30 tons.

Reverting to the crushers, they are of the single roller type, in which the coke fed into the hopper is passed between a roller and an adjustable grid—both the rollers and the grid being made of steel. The screens are 6 feet long and 3 feet diameter, and work at twenty revolutions a minute. The grid-plates are 2 ft. 4¾ in. square. In the screen, we have a departure from what is usual, as Mr. Jolliffe determined to try expanded metal, instead of wire meshing or perforated plates. This metal has several advantages; and it remains to be seen whether its wearing qualities will be equal to, or better than, other types of screen-plate. The large coke is delivered over the end of the screen into the hopper; and the small, as previously mentioned, passes into the part of the hopper which has been divided from the main part by means of inclined plates.

The driving arrangements for the hot-coke conveyors and the cross conveyor are rather unique. A hydraulic motor—placed just above the lower end of the cross conveyor, and easily accessible from the stage-floor of the retort-house—is employed. The motor is of the Brotherhood type, made by the Hydraulic Engine Company. It develops 13-horse power, and runs at a speed of 47 revolutions per minute, being coupled direct to a main shaft, which is carried on brackets bolted to the end wall of the house. On the shaft are keyed two No. 4 chain wheels, each fitted with a claw-clutch, which enables the operator to put either of the hot-coke conveyors out of action. The chain drives a wheel keyed on to a countershaft, which is also fitted with spur pinion, gearing with a steel wheel secured to the end shaft of the conveyor. The speed of the conveyors is about 48 feet per minute. The same main shaft drives the cross conveyor in this way: A pair of bevel wheels

work a short vertical shaft, which has attached to the lower end a small bevel pinion, which works into the teeth of a larger wheel keyed direct on to the end shaft of the conveyor. The arrangement is simple and very neat, dispensing as it does with a large amount of gear. The ease with which the plant can be put in and out of action is highly spoken of from the experience so far at Ipswich; and the motor is looked upon as being particularly well adapted for this class of work. The long yard conveyor, and the crushers and screens, are similarly driven by a 13-horse power hydraulic motor, which is placed close to its work on the top of the hoppers. From a wheel keyed on to the end of the shaft, a chain transmits power to a countershaft, which passes through the framework of the conveyor, and runs at 36 revolutions per minute. From this a drive is taken by spur gear to the end of the shaft of the yard conveyor; and from another point a chain-drive actuates the countershaft of the crusher on to which it drives—the countershaft running at 30 revolutions, and the crusher shaft at 10 revolutions per minute. From the opposite end of the crusher shaft, a chain-drive is taken to the countershaft of the revolving screen. Clutches are placed on all the wheels, so that any section of the plant can at will be run separately. In the exhauster-house, next to the air-compressing plant, is a new engine for driving the hydraulic plant. This engine works to 700 lbs. to the square inch.

Carts are loaded underneath the hoppers; and arrangements have been made for loading railway waggons by means of long shoots. This, however, will necessitate the moving of the railway lines running through the yard something like 11 feet nearer the hoppers; and this work is to be taken in hand as soon as opportunity serves. The cost for loading hitherto has been about 7d. per ton; as soon as the prospective arrangements are completed, the loading of the railway waggons will be done for practically "next to nothing."

The Engineer speaks highly of his new coke plant; and so far as one can judge the plant at this early stage of its working existence, it has been exceedingly well constructed, and runs well. It contains within it all the latest ideas that have been formed from the extensive experience of the Contractors of what go to constitute good conveyors.

For the opportunity afforded us for inspecting the completion of the scheme as here described, we have to thank Mr. Jolliffe, and to acknowledge his courtesy and that of Mr. Frank Prentice in placing so large an amount of information at our disposal in preparing this descriptive account of their latest possessions, which have removed their principal material from the domination of manual labour, and put it under mechanical agencies from the Orwell to coke heap, cart, or railway waggon.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see page 562.)

THE improved tendency in the Stock Markets generally which showed itself after the conclusion of the mid-November account was continued last week right up to the close, so that prices for two weeks running (a rarity of late) show a progressive improvement. There was some little profit-snatching towards the end; but the situation was good enough to bear it. The settlement was attended with one small disaster; otherwise it was not formidable. The Money Market was active and strong, owing to Stock Exchange and other requirements, rates were well up, and the demand for discount was a bit sharper; but the chances are that the 4 per cent. rate will last out the year. Business in the Gas Market was much more quiet than in the preceding week, the liveliness of which soon died away; but this was not accompanied by any weakening of the market. On the contrary, the tendency was distinctly favourable, and most of the principal stocks made more or less solid advances. In Gaslight and Coke issues, the ordinary was animated on most days, but with lulls in between; and, after a little hesitation, it made rapid strides upward. On Monday, it had changed hands as low as 85¼, but on Saturday it marked 89½, and the quotation showed a gain of three points. Of the secured issues, the preference was very firm, and gained a point. South Metropolitan was not particularly active, nor were actual prices remarkable; but the quotation was 1 up. Commercials suffered from being offered in the absence of buyers, with the result that quotations were put down. Business in the Suburban and Provincial group was almost at a standstill, and nothing moved in the London market. Newcastle advanced a point on the local Exchange. The Continental Companies were very much quieter; but they remained firm. A rise in the buying price of Imperial was the only change. Among remoter undertakings, Hong Kong was higher, and River Plate lower. In Water, much agitation was caused by the decision of the Arbitrators on the previous Saturday as to the illegality of the New River Company paying dividends in excess of 10 per cent. since 1852, and subsequent pronouncements of the tribunal have not been encouraging. Many quotations have naturally given way; the secured issues as a class being the chief sufferers.

The daily operations were: Gas opened fairly brisk; but prices were not very good. Hong Kong rose 1; but Imperial debenture fell 1½. In Water, New River relapsed 30, Kent 5, and Southwark 2½. On Tuesday, Gas business was very slack, and nothing moved. In Water. East London 3 per cent. debenture fell 1½. On Wednesday, a revival in Gas began to show itself; and Gaslight ordinary rose 1. In Water, Southwark preference dropped 3. On Thursday, Gas prices progressed nicely. Gaslight ordinary and preference and South Metropolitan gained 1 each; but River Plate fell ⅛. In Water, West Middlesex 3 per cent. debenture moved down 2. Friday was quiet, and Commercial 4 per cent. receded 1, and ditto 3½ per cent. 2. West Middlesex Water rose 2½. Saturday was lively and strong. Gaslight ordinary and Imperial went up 1 each. In Water, Chelsea 5 per cent. preference fell 4, ditto 4½ per cent. 1, and debenture 3, New River 10, and West Middlesex 4½ per cent. and 3 per cent., 1 each.

OBITUARY.

HENRY AITKEN.

WE regret to record the death, on the 21st ult., at his residence at Darroch, Stirlingshire, at the age of 65, of Mr. Henry Aitken, whose name will be remembered by many of our readers in connection with the gas-making process devised by him in conjunction with Mr. William Young. The process was patented in their joint names on Aug. 3, 1875—rather more than 28 years ago—and was taken up by the West of Scotland Association of Gas Managers, now merged in the North British Association. A Committee, consisting of the late Mr. W. Smith, of Helensburgh, Mr. J. M'Gilchrist, Mr. S. Stewart, Mr. R. S. Carlow, and Mr. Levi Monk, was appointed to investigate it; and they presented their report at the Lanark meeting of the Association in April, 1877. The importance attached to the report may be gauged from the fact that it gave rise to considerable discussion. The process was adopted at the Hamilton Gas-Works, where it was inspected on several occasions early in the above-named year by the late Dr. Wallace, who also reported upon it; and Mr. Aitken himself described it to a meeting of the Association held at a subsequent date. The object of the "analyzer," as the plant was called, was the enrichment of gas by carburation; and it was stated to be effecting it satisfactorily at Hamilton. The process was adopted in other gas-works. Mr. Aitken identified himself with the West of Scotland Association, before whom, in 1878, he read a paper on the "Influence of Aqueous and other Vapours upon Illuminating Gas;" while his colleague, Mr. William Young, who happily is still with us, has enriched the transactions of the existing Association and gas literature generally by his valuable contributions.

The death occurred last Saturday week, from pneumonia, of Mr. JAMES VASEY, the Chairman of the Northallerton Gas Company. Deceased was 65 years of age.

PERSONAL.

The many friends of Mr. W. R. COOPER, of Banbury, will be pleased to learn of the honour which has been conferred upon him by his being placed upon the Commission of Peace for Banbury.

At the regular meeting last Wednesday of the Evening Star Lodge, No. 1719, Bro. W. B. RANDALL, the Manager of the Waltham Abbey Gas Company, was elected W.M., in succession to W. Bro. A. E. Broadberry, of Tottenham, whose year of office expires in March next.

Our readers are aware that, in consequence of nervous breakdown, Mr. JAMES W. HELPS has been granted three months' leave of absence. In accordance with the arrangements mentioned in the "JOURNAL" on the 17th ult., Mr. Helps left England on Wednesday for Marseilles, where he expected to join the *Mongolia* for Bombay on Friday. We understand that he has not settled any special tour in India; but he looked forward to visiting Lahore, Allahabad, and Simla—returning from Calcutta in the early Spring. We are pleased to learn that he started upon his journey in good spirits, and physically strong; and we sincerely trust that change of scene and occupation will prove efficacious in thoroughly restoring him to health.

Last Saturday evening, at Beale's Restaurant, Holloway, a very handsome liqueur cabinet was presented to Mr. T. S. LACEY, the Engineer-in-Charge of the St. Pancras station of the Gaslight and Coke Company, who, as already announced, has been appointed to a similar position at the Bromley station. The occasion was the twenty-sixth annual dinner of the Gaslight Cricket Club, of which Mr. Lacey is President. Mr. G. W. Newth, in making the presentation, thanked Mr. Lacey, on behalf of the members, for the kindly interest he had taken in the Club during his stay at St. Pancras. In reply, Mr. Lacey said that the presentation had come to him unexpectedly, and he accepted it as an expression of the kindly feeling that had always existed between the Club and himself; and between himself and the men under him. Like others, he was pleased at being promoted to a higher station; but he was sorry to leave the many friends he had been fortunate enough to make during his two years' stay at St. Pancras. He thanked them heartily for the way they had expressed their feelings of friendship towards him.

NEW PATTERNS IN GAS-FIRES.

One of the most pronounced difficulties that the makers of gas-fires have been confronted with has been to escape from the beaten paths of style. Many have been the attempts, but few the real successes; and, as has before been pointed out, the makers have received little encouragement from their patrons. The Cannon Iron Foundries, Limited, however, have just brought out a new series of some half-a-dozen patterns, which show a praiseworthy attempt to produce fresh artistic effects. The principal of these have been named the "Triton," the "Iris," the "Lily," and the "Vesta;" and all of them, apart from their other qualities, have a highly ornate appearance, which makes them suitable for any room. The surfaces are cast beautifully smooth and clean, and are finished in various manners to suit the differing tastes of purchasers. In all the types, the grate and side bars are in one piece, which can be released by the removal by hand of a couple of small screws with brass knobs for heads. By this means, the whole of the interior of the fire can be taken out without disconnecting the gas supply. The fuel holder is neatly connected to the frame by lugs, and keeps the fuel quite independent of the burner. Thus the burner can be instantly slid out for cleaning without interfering with any other part. The "Triton" is equally adaptable to a drawing-room or nursery. On the top, it has a boiling-ring, which, when not in use, is covered by an ornamental loose top, so that the existence of the ring does not detract from the artistic quality of the fire. The "Iris" is a very pleasing production; and the studs around the frame (as seen in the illustration) can, if desired, be of polished copper. These impart a very striking effect. The "Lily" has also a boiling-ring on the top, with an ornamental domed cover; and the frame is made in several styles of finish. Similar remarks apply to the "Vesta." The "Lute" gas-fire is a smart design for fixing into ordinary 12, 14, or 16 inch coal grates, by simply removing the bars. But good looks are not everything; and while paying attention to the exterior of the stove, the Company have not neglected to bring their experience to bear in getting the highest duty from the new fires for a moderate consumption of gas. The "Coronation" condensing radiator is another of the Cannon specialities. It is an imposing structure, but occupies little space; and it can be built up of any number of tubes according to requirements. One of the features is the safety-lighting door, which, on being opened, revolves over the top of the burners and completely closes the passages of the condensing or radiating tubes, so that gas (when lighting up) cannot possibly accumulate in the tubes. It is obvious that the Company have devoted considerable time and thought to the production of this new series of fires.

THE "IRIS."

THE "TRITON."

Model Clauses in Bills and Orders.—At the meeting of the County Councils Association last Wednesday, the Parliamentary Committee presented a report, in which they recommended that the Secretary of the Association should be instructed to obtain from different counties suggestions as to points on which model clauses are desirable for insertion in Bills and Orders relating (*inter alia*) to electric lighting; and that when such information had been obtained, a deputation should wait upon the Local Government Board, the Board of Trade, the Chairman of the Standing Orders Committee of the House of Lords, and the Chairman of Ways and Means of the House of Commons, to suggest that such clauses should be embodied in an Act similar to the Lands Clauses, the Gas-Works Clauses, and the Water-Works Clauses Acts. The report was adopted.

The Penn Family and William Murdoch.—In the "JOURNAL" last week, we recorded the death of Mr. John Penn, M.P., the principal member of the well-known engineering firm of that name. The sad event called for notice in our columns mainly from the fact that the deceased was a Director of the Kent Water Company. But, curiously enough, another circumstance connected him indirectly with the gas industry, inasmuch as his father was indebted to William Murdoch for an idea which aided materially in the building up of his gigantic business at Greenwich and Deptford. In the early years of last century, John Penn, the founder of the concern, made the first marine engine; but quite forty years previously, Murdoch had invented the oscillating cylinder. The idea was neglected until Penn recognized its value for the motors he was constructing. He successfully overcame the practical difficulties; and in 1838 he was building steamers worked by engines designed on this principle. The importance of the discovery need not be emphasized. It has been of the very highest value; and for it the world is really indebted to the Ayrshire miller's son, who showed, at his little house at Redruth, how the gaseous product of the distillation of coal could be employed for domestic lighting.

SOME INVESTIGATIONS INTO ELECTROLYSIS AT RICHMOND (Va.).

As the result of a long controversy on the subject of the electrolysis of water-mains at Richmond (Va.), an examination of the mains has lately been made by Mr. D. H. Maury, of Peoria (Ill.), and the results are given in a recent number of the "Engineering Record." There are two traction companies, working under one management, in the city; and as they have been engaged in a reconstruction of their properties, the present condition of the track is very good indeed. It may be of interest, therefore, to see what Mr. Maury has to say concerning electrolysis under conditions which are regarded as favourable for its reduction.

There were examined altogether 101 lines of pipes, which were exposed by means of 50 excavations; and measurements were made of the differences of potential between the main and the nearest rail at about 60 places. These differences were unusually low compared with readings in other cities; most of them being less than a volt in localities where the pipe was positive to the rail. Every pipe examined was found to be carrying some current; the quantity ranging from very small fractions of an ampere to 18 amperes. In every instance, also, the outside of the mains showed evidences of electrolytic injury—rarely very slight, and often very serious. No examination could be made of the condition of the inside of the pipes; but there was evidence that interior pitting was taking place. The pitting on the outside of the mains on the positive side of the joints in districts where the pipes were negative to the earth, the lead compounds in the soil in front of the joints, and several leaks in the joints, indicated the probability of such inside pitting. Well-defined pittings were found in an 8-inch main laid only six weeks before the examination took place.

The damage to the system of mains has been estimated by Mr. Maury as amounting to about $170,000. This figure was reached by measuring the maximum depth of the outside pittings on the 101 mains which were laid bare, and estimating the total depreciation from these measurements and the lengths of the pipes. This does not include the deterioration of the service-pipes, more than 200 of which had burst from injury due to electrolysis. Much of this damage must be ascribed to conditions no longer existing, but for which the traction companies seem to acknowledge some responsibility. The remedy for the continuing injury which Mr. Maury recommends is the adoption of a properly constructed and maintained conduit system or double-trolley system, which he says will absolutely prevent further injury to the pipes; and he adds that this result can be attained by no other known practical method.

The late Mr. William Blaber, the Chairman of the Antwerp, Falmouth, and Sutton Water Companies, left estate of the gross value of £34,541, including £28,388 net personalty.

The late Colonel Josiah Wilkinson, whose death was recorded in the "JOURNAL" for the 27th of October (p. 206) left property valued at £233,924, including £182,342 of net personalty.

A recent number of the "Engineer" contains an illustration of a fine hydraulic coal-hoist recently erected at Glasgow Harbour by Messrs. Sir William Armstrong, Whitworth, and Co. It is capable of dealing with loads of 25 tons; and the waggon cradle can be lifted and tipped at a height of 50 feet above the level of the quay.

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Quarterly Meeting at Halifax.

The 136th Quarterly Meeting of the Institution was held at Halifax last Saturday; and the proceedings commenced with an inspection of the gas and chemical works of the Corporation, by invitation of the Gas Committee.

Visit to the Gas and Chemical Works.

On arrival at the works, the party were received by Mr. J. Wilkinson, the Engineer and Manager, Mr. J. F. Smith, his Assistant, and Mr. R. T. Stoddard, the Manager of the chemical department. The inspection lasted for about an hour-and-a-half; and particular attention was directed to the carbonizing arrangements—both the machine charging of the horizontal retorts and the inclined installation. A considerable time also was spent in the chemical works. Anything like a detailed account of what was seen at the gas-works, is, however, unnecessary, in view of the fact that rather more than a twelvemonth ago a general illustrated description of them appeared in the "Journal" [see Vol. LXXX., pp. 741-46] in connection with the visit to Halifax of the Institution of Gas Engineers, during the presidency of the late Engineer, Mr. Thomas Holgate.

On the party reaching the tar-works, Mr. Stoddard was able to give a most interesting account of the various operations carried on. First of all, the tar is pumped direct from the gas-works into two storage tanks—each having a capacity of 60 tons—and elevated sufficiently high to allow of the tar being run by gravitation through the blue-oil and creosote-oil condensers. By this means, the tar is heated prior to passing into the still, which is of the continuous type designed by Mr. F. Lennard, and heated by fuel gas produced from coke on the works. The hot tar is taken from the bottom of the condensers at a temperature of about 170° C., and passed down a vessel filled with special packing. This divides the tar into fine streams while passing down. At the same time, a small quantity of superheated steam is admitted into the bottom of the vessel. This drives off the water, and a portion of the crude naphtha in the form of vapour, which is afterwards condensed in a water-cooled condenser. The tar, after being freed from water, &c., is passed through the bottom of the pitch scrubber (where it is further heated) into the still.

The still consists of a coil of pipes built in an oven; the pipes and flues being so arranged that the fresh tar comes into contact with the coolest gases, and passes on until it meets the hottest gases. The tar at this point reaches a temperature of 260° to 270° C. It is then passed into the pitch scrubber. This vessel plays the part of a separator of the liquid (pitch) and the gaseous products. The latter ascend to the top, and are carried away through three condensers. The former (the pitch) is allowed to pass down through the separator, which is packed in a similar manner to the one when the water is extracted from the tar; and at the same time a small stream of steam is allowed to pass in from the bottom. The steam is for the purpose of liberating any oil which the pitch may be still holding.

The steam-pipe is the means of altering the "twisting" point of the pitch. If a soft pitch is desired, practically no steam is used; but if a hard pitch is required, a fair quantity is passed through. There is a working level of 4 to 5 feet of the hot pitch at the bottom of this vessel; and this serves for further heating the tar after having the water extracted (as described above). The extraction of the heat from the hot pitch by means of the tar allows of the pitch being run continually into the pitch-bed, without emitting any noxious gases.

The gaseous products, as they leave the top of the pitch separator, are conveyed in succession to the vessels, where they are condensed according to the temperature of the envelope surrounding the vapours. The first and second are cooled by means of fresh tar; and the third (the light oil condenser) is cooled by water. The condensed liquids are received in suitable underground vessels; and from there conveyed, by means of compressed air, to the storage tank, which is divided into six compartments, each having a capacity of 13,000 gallons.

In addition to the Lennard tar-still, there are three other stills fitted with fractionating columns for refining the naphthas, the naphthalene, and the carbolic acid. Plant has also been erected for the refining of naphthalene (by hydroextraction), the manufacture of disinfecting powders, and liquid disinfectants.

The railway facilities at the works are very good. A branch line has been taken from the Great Northern Railway through the works; and this allows of the pitch being loaded direct from the pitch-bays (which when full will hold upwards of 1200 tons) into the railway trucks. The railway oil-tanks can also be loaded from the storage tanks.

For the present, compressed air and steam are supplied to the plant from the gas-works. The Lennard still, the condensers, and the receiver are worked under a slight vacuum; and after the waste gases have been washed, so as to free them of any light products, &c., they are burned under the still.

The Luncheon.

After the inspection, the members assembled at the White Swan Hotel, where luncheon was served. At the conclusion of this, there was time only for one toast besides that of "The King"—namely, "The Corporation Gas Committee," which gave Mr. H. Townsend, of Wakefield, an opportunity of acknowledging the kindness of Mr. Wadsworth, the Chairman, and the other members of the Committee in permitting the Institution to visit the works that morning.

Business Meeting.

On the meeting being formally constituted, with the President (Mr. Samuel R. Ogden, of Blackburn) in the chair,

The Hon. Secretary (Mr. H. Kendrick, of Stretford) read the minutes of the previous meeting, which were confirmed.

Appointment of Scrutineers.

Messrs. Grimshaw and Buckley were appointed Scrutineers of the ballot-papers for the election of officers for 1904.

Affiliation with the Institution of Gas Engineers.

The Hon. Secretary read the following letter from the Secretary of the Institution of Gas Engineers, referring to the desirability of affiliation:—

Nov. 16, 1903.

H. Kendrick, Esq., Hon. Secretary, Manchester District Institution of Gas Engineers.

Dear Sir,—My Council have given full consideration to the suggestion made by the Past-President, Mr. Dougall, as to the desirability of the affiliation of the District Associations, and have instructed me to call the attention of your Committee to the Articles of this Institution bearing on the subject.

I am, therefore, to ask that your Committee will give their best consideration to the suggestion that your Association should become affiliated with the Institution, subject to these Articles, copies of which I enclose.

My Council wish particularly to point out that such affiliation as they contemplate does not involve either change of name, dissolution, or any interference in the existing management of your Association.

It is desired that suitable arrangements should be made for the representation of your Association on the Council of the Institution from year to year, and that those of your members who do not already belong to the Institution should be admitted thereto without payment of the usual entrance fee.

(Signed) Walter T. Dunn, Secretary.

Mr. T. B. Ball (Rochdale) asked whether the feeling of the members of the Manchester Institution would be taken before anything was done in the matter. For his part, he did not see the object of affiliation, if it involved no alteration.

The President said that nothing had been decided upon yet as to the course which the Gas Institution would take in connection with the organization. Probably, the initiative would come from that body; and then the matter would be submitted to the members of the Manchester Institution.

Mr. W. W. Hutchinson (Barnsley) moved that, before any action be taken in the matter, it be submitted to the members and their consent obtained.

This having been seconded by Mr. H. Hawkins (Todmorden) was carried.

Vote of Condolence.

The President moved that a vote of condolence with the family of the late Mr. Richard Merrell be passed. No doubt, he said, there were many present who knew Mr. Merrell better than he did; and he was sure that the proposition would be readily agreed to.

The resolution was passed unanimously.

Reading of Papers.

"Why Corporations and Companies should Undertake Internal Fitting Work," by Mr. A. E. Mottram, of Ossett. "Incandescent Lighting and Maintenance," by Mr. S. Meunier, of Stockport. These two papers were next read and discussed together. See pp. 539-47.

Scrutineers' Report.

The Scrutineers' report showed the election of officers for the year 1904 to have been as follows:—

President.—H. Townsend, of Wakefield.
Senior Vice-President.—S. Meunier, of Stockport.
Junior Vice-President.—J. H. Brearley, of Longwood.
Hon. Treasurer.—Thomas Newbigging.
Hon. Secretary.—H. Kendrick, of Stretford.
New Members of Committee.—J. H. Crowther, of Wallasey; G. W. Lupton, of Otley; H. Hawkins, of Todmorden; C. Elliott, of Leyland.
Auditors.—E. Lord, of Whitworth; W. Everitt, of Ilkley.
New Members.—J. C. Belton, Chester; J. T. Byrom, Johnstown, Ruabon; R. H. Ginman, Tyldesley; J. R. M'Kensie, New Mills; W. E. Roberts, Woolton; J. Smith, Congleton; H. O. Timmins, Hindley; E. J. Wellens, Hebden Bridge.

Vote of Thanks.

Mr. G. W. Lupton (Otley) proposed a vote of thanks to the readers of the papers.

Mr. J. H. Buckley (Formby) having seconded the motion, it was carried unanimously.

Mr. Mottram and Mr. Meunier returned thanks, and the proceedings terminated.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

The members of this Association, accompanied by their President (Mr. Walter Grafton) and Secretary (Mr. P. F. Scarth), paid a visit last Saturday to the works of the Tottenham and Edmonton Gas Company; and there they were heartily received by the Engineer (Mr. A. E. Broadberry) and the Secretary (Mr. James Randall), both of whom with the Assistant Engineer (Mr. J. Terrace) and Mr. W. E. Dean (one of the junior assistants) paid them every attention. Mr. Broadberry himself took great interest in the event. He personally headed the party, pointed out the features of the plant, and explained the great changes which time and increasing business have produced. No one is better able than he to do this, as he has, under his father and now as chief, grown with the works, and has witnessed and helped to produce these changes. His example, in personally taking an interest in this inspection, we hope will be, as far as circumstances allow, followed by the engineers of all works visited by the junior members of the profession, who very highly appreciate such attention, and deem it an honour to themselves, and a recognition by their seniors of the value of the organized work they (the juniors) have undertaken on their own behalf.

At the entrance to the works, Mr. Broadberry received the members, and addressed a few words of welcome to them, and then mentioned that the original works, when started sixty years ago, were all congregated at the end of the site at which they were then assembled. But they had gradually grown and developed, bit by bit, northward, until recently they had had to devise a scheme for remodelling, and laying them out on some recognized plan. This work had been proceeding now some four or five years. Part of the apparatus had been moved, and part of it condemned. All the new plant was being laid down in a more central part of the site; while further extensions were to be made still further northward.

The visitors then spent about an hour-and-a-half in inspecting the works. What they saw is being made the subject of two special articles, the first of which appears to-day—see p. 528.

At the close of the inspection, the visitors were kindly entertained to tea, by invitation of the Directors, in the works offices. Before leaving, Mr. Grafton, on behalf of the members, said he wished to thank Mr. Broadberry, Mr. Randall, Mr. Terrace, and Mr. Dean, for their genial reception and for the great patience and pains they had bestowed upon the members. In the works, they had seen a great many things, and had all learnt something. They were not only indebted to the officers of the Company, but to the Directors for their kindness in permitting them to visit the works, and for the hospitality shown them. He moved that the heartiest thanks of the members be passed to all concerned for their generosity. Mr. O. W. Dougan, in a few appropriate words, seconded the motion; and it was cordially agreed to. Mr. Randall first responded, and mentioned that, when the Directors heard of the desire of the Association to visit the works, they unanimously and readily acquiesced, and believed that they would have something to show the members. The works were in a state of transition at present, and somewhat disordered; but those who had experience of works of this character would know that this was unavoidable while so many changes were going on. If the visit had afforded the members intellectual gratification, the Directors would feel themselves amply repaid. In his concluding remarks, he said that, so long as it had taken gas to supersede oil and tallow, so long would it take any other illuminant to beat gas; and therefore they could all go on with cheerful hearts, feeling that gas would continue to hold its own. Mr. Broadberry responded on behalf of himself and his staff. He jocularly remarked that he took an even more hopeful view of gas than Mr. Randall, believing that it would continue to be *the* leading light of the future.

This ended a most interesting and profitable visit for the members.

A Guide to the Housing Acts.—Now that gas companies occasionally apply to Parliament for permission to erect dwellings for the accommodation of their workmen, their officials may be interested in a little book bearing the above title which has just been published by Messrs. Eyre and Spottiswoode. It appears from the preface that there has been a general complaint, by local authorities and others engaged in carrying out the administration of the Housing Acts, of the difficulties they experience in grasping the powers they possess under the complicated sections of these Acts; and it is to assist them in doing so that the book has been prepared. The task of guiding them through the mazes of the various enactments bearing upon the subject was undertaken by Mr. Arthur P. Poley, B.A., of the Inner Temple and the Midland Circuit; and we believe those who follow him will find him to be thoroughly trustworthy. His explanations are clear and concise, his text is freely annotated, and he has given a table of cases. Appendices contain the statutes affecting housing from 1882-1903, together with the forms and circulars of the Local Government Board, and these are followed by an index. Apart from its contents, the book may be recommended for its compactness, as it can easily be carried in the pocket if necessary.

WHY CORPORATIONS AND COMPANIES SHOULD UNDERTAKE INTERNAL FITTING WORK.

By A. E. Mottram, of Ossett.

[A Paper read before the Manchester District Institution of Gas Engineers, Nov. 28.]

The *agenda* of a Gas Association meeting does not seem to be complete at the present time unless it contains a paper pointing out one of two ways in which we can increase the number of our consumers; and so it is from this standpoint that I approach my subject.

In going about our districts of supply, no doubt we have all been troubled to see two or three houses here, and two or three there, and perhaps a whole row in the next street, looking very dismal and cheerless in the semi-darkness cast around by a fitful tallow candle, or, worse still, by an oil-lamp. And if we have taken the trouble to ask why the people do not brighten up their homes—as they can do so cheaply by the aid of incandescent gas-burners—the reply we all know so well is that the fittings are bad, or they have no fittings in, and that the landlord will not do anything for them. Cottage property owners in particular are great sinners in this respect. Consequently, it is the working class that suffer most inconvenience. Working men like a good light in their homes; but they strongly object to spend money on gas-fittings in other people's property. They are anxious to become gas consumers if the necessary appliances are at hand.

In my town, slot meters, together with a griller, have been fixed for some years back, for anyone applying for them; but I noticed a great many houses without gas in—pointing to something still wanting. Then a neighbouring District Council made an agreement with my Corporation that we should take the gas into their township, and run a main about a mile long down a certain road by a fixed date. I laid this main, which ran past about 120 houses, and expected to have a fair number of applications for meters. I had only one. The houses had not any fittings in, and no one seemed willing to go to any expense to instal them; and so this main looked like being a dead loss.

I now looked thoroughly into the question of slot fittings, and soon satisfied myself that it would be to the public benefit, and also to the advantage of my works, and that I should not be injuring anyone by lending fittings, and fixing them, with the landlord's consent, for all who were anxious to become gas consumers. When I then laid the matter before my Committee, they at once gave me full authority not only to adopt slot fittings for cottage houses, but to undertake other internal fitting work, and also to include incandescent maintenance. I decided to fix free one pendant or harp light with incandescent burner, and two brackets, together with a griller or slot cooker. We distributed illustrated circulars around the district, and also put a large advertisement in the local newspaper. I very quickly had to withdraw this, and place in its stead an advertisement for plumbers wanted—the rush of applications for fittings proving the necessity for our undertaking the work.

I would emphasize the importance of lending an incandescent burner. It has brought me scores of consumers. In many cases one tenant in a block of property would apply, the rest holding back to see what sort of a light it gave; and when they saw what a splendid light they could have, lasting for five or six hours for a penny, they were quickly converted. In twelve months time I have increased the number of my consumers by 25 per cent.; and instead of the one consumer out of 120 on the road referred to above, I have now 115, and building operations are proceeding briskly.

Another neighbouring Urban Council had been wanting gas in their district for some time; but it was doubtful whether it would pay us to lay the mains. After our internal fitting work proving so successful, however, we offered to lay the pipes if they would adopt the Lighting Act, and light up the roads. This they were willing to do, but could not afford on their small ratal to pay at one time £300 or £400, the first cost of the lamps. So to get them out of the difficulty, we offered to provide and fix them 100 lamps complete on the hire-purchase system—they to pay for them in ten annual instalments. This was agreed to; and now they are proud of being among the best lighted villages, both inside and out, of any in the country.

Referring to my statement that by adopting internal fittings I should benefit the public, benefit my department, and injure no one, I am claiming that we gain everything and lose nothing by it. The enormous demand all over the country for slot fittings points to their being a public benefit. They certainly enable the working classes to participate in the advantages of gas, which previously they have had to look upon as the luxury of their fortunate neighbours with fittings in their houses, or of those who were in a position to dictate "fitting terms" to their landlords. To show that they appreciate them, out of the hundreds I have put in, I have not had a single customer fall back again to either electricity, oil, or candles. There are several ways in which we at the same time benefit by this work. We greatly increase our consumption at small cost, we increase our consumers per mile of main, turn many unprofitable streets into good ones, spread good fittings up and down, and advertise a good light in every part of

our district. I have never had a single complaint of bad gas where we have put in the fittings.

Plumbers the country over have, I am afraid, claimed that they alone have the sole right to all fitting work beyond the meter. We have only ourselves to blame for this, for letting the work go so long by default; and now when competition is making us look around, we see how much we have been at their mercy, and to what an extent our consumption has been throttled for the want of a little push and attention to this department. In our case, the plumbers have grumbled but little (chiefly at our selling mantles and globes cheaper than they can); and I see no reason why we should not work very well together. By pushing and extending the gas over the district, we have brought a lot of work to them. We, of course, do all work up to the meter; and where we lay a service across private ground, for which we have to charge, if we do it at cost price, or even under, they cannot grumble, as they are not in competition for this part of the work. For fittings we have put in for ordinary meters, however, we have charged a fair trade price; and I fail to see what right the plumbers have to object to us, who have to live by selling our gas, dealing in the articles that enable the public to consume it. Gas fitting is only a small part of a plumber's business; and so long as we keep off the other departments of his trade, and hold to our own department, we have nothing to fear. The houses into which we have put slot fittings have been waiting for twenty years or more for gas. Ample time has therefore been allowed for orders to be given to the plumbers; so I fail to see how we can have robbed them of something they never had. I am sure if they would seek some of this work, they would meet with success; and if our competition induces them to reconsider their business methods, we shall have done them good service.

In a very short time those towns that do not undertake internal fittings will be as far behind the times as those are to-day who do not fix slot meters. Our slot fittings have cost, on the average, 15s. 1d. per house. We have all been satisfied for some time that slot meters are profitable business; and those who have not gone to the extent of putting in fittings will soon see their way to expend a further 15s. 1d., and tap an extensive market for gas.

The following is the method we use of booking this work:

No.....

	£	s.	d.
.....Slot meter			
.....Cooker			
.....Pendant			
.....Brackets			
.....Compo. pipe			
.....India-rubber tube			
.....Taps			
.....Burners			
.....Time			
.....			
.....			
.....			
.....			
Total . . .			

No.....

TENANT'S APPLICATION

FOR

SLOT METER AND FITTINGS.

(For Small Cottage House only).

To the Ossett Corporation Gas Committee.

I hereby request you to supply and fix at my residence, subject to the undermentioned conditions, the following articles:—....Slot meter, ...Slot cooker, ...Pendant, ...Brackets, ...Burners, together with the necessary piping and connections.

I undertake to deliver to the Corporation when leaving the premises, or on demand, the above articles in good order and condition (ordinary wear and tear excepted), and to replace any of the same which may be damaged whilst in my possession; at the same time relinquishing all claim to such damaged article or articles.

I also undertake to hold myself liable for all gas registered by the index of the meter should the automatic arrangement become deranged in any way, and to give free access at all reasonable hours to the Corporation's officials for the collection of the money or any other necessary purpose.

Signature of tenant.....

Address.....

Date.....

DECLARATION TO BE SIGNED BY LANDLORD OR AGENT.

(To be obtained by the Tenant.)

I hereby authorize the Ossett Corporation to fix and remove if necessary the above articles. The cost to be borne by the Corporation; but such articles shall remain the property of the Corporation, and shall not be distrainable for rent.

Signed.....

Date.....

These forms are bound into a book. We have on one page the tenant's application, landlord's authority, and materials used priced out. An index to this book is kept; so that we can turn at once to any house. We also carry the prices out under their separate headings into a summary book; so that we easily get at the total cost.

We hear sometimes of slot meters not being pushed for fear of the consumers wanting to change from ordinary meters to slots, and, consequently, having a lot of ordinary meters thrown on our hands. My predecessor at Ossett, with commendable foresight, lent grillers, &c., with ordinary meters the same as with slots. I have not, therefore, been bothered with a lot of ordinaries thrown on my hands. This is, in my opinion, the best cure: Lend free as much as you possibly can to ordinary consumers, then there will be no inducement for them to change to slots.

Architects and builders are, I am afraid, to blame for a good deal of poor gas-fitting in towns where the fittings are not examined by an inspector before being plastered over. Tenders are sometimes invited for gas-fittings—only specifying so many lights per house. Consequently, one plumber will allow for one size of pipe, another for another size; and the one who sends in the lowest tender gets the job. Then, when the consumer cannot get a proper light, we are blamed for bad gas. In Ossett I have been appointed Inspector of Gas Fittings. With this authority, I sent a circular round to all architects, builders, and plumbers in the district, specifying what size of fittings I required; and now tenders are often invited for so many lights per house, fitted in accordance with my official specification. This is very much better. The plumbers all now tender on an equal footing, the public also greatly benefit by the improved light they obtain, and the property owner gets something (that he probably knows nothing about) protected and inspected free of charge. I require 48 hours' notice before any fittings are plastered over; and the men do not connect the gas to any new property until my certificate has been obtained.

In undertaking internal fitting work, we, of course, increase the chances of possible claims being made against us for damages caused by gas escaping, owing to alleged defective workmanship. A case in point occurred at Brighton about twelve months ago. The Brighton and Hove Gas Company were sued for, and had to pay, damages for injury said to have been caused by gas escaping from fittings not put in by the Company, but to which the Company had attached a pipe to supply a gas-fire. This is a serious matter, and opens up the question whether it would not be advisable to protect ourselves in some way from these possible claims. I have paid damages for gas escaping from the main up an old drain into a house, and also for one of my men leaving a flag up and someone stumbling into the hole. These, together with the further risks I have incurred (as shown by the Brighton case), have brought me to the conclusion that it is advisable to take out an insurance policy, covering all these third-party risks; and I have at the present time got in hand policies and prices to lay before my Committee at their next meeting. Premiums for these policies are very heavy; and if all gas undertakings would join together to form a mutual insurance fund, I believe that we could fully protect ourselves at a very much cheaper rate.

The adoption of internal fittings has brought me more worry and work; but the time has come when we cannot afford to sit in our office all day. It has taken me into every nook and corner of my district of supply, and brought me into much closer touch with my consumers, which is in itself a strong argument in favour of our undertaking internal fitting work.

INCANDESCENT LIGHTING AND MAINTENANCE.

By S. MEUNIER, of Stockport.

[A Paper read before the Manchester District Institution of Gas Engineers, Nov. 28.]

The Manchester Sub-Section of our Commercial Association have, among other things, lately been obtaining particulars of costs, &c., upon the subject of this paper; and the original project as laid out by our Secretary, Mr. Kendrick, was that points of discussion could be profitably suggested by comparing the figures of the various towns represented on the tabulated list. As regards public lighting, this may apply—19 towns being in a position to give returns; but as regards private lighting, no doubt owing to the fact that most of the undertakings belonging to this Sub-Section are in the hands of public bodies, this has been found impossible—only three undertakings having the system of maintenance in use, one of which has at the present but eight burners under notice.

Private Lighting Maintenance.

—	No. of Burners.	Charge per Month.	Material Supplied.	Cost per Burner per Annum.	Mantles used Annually.
No. . 1	8	—	Mantle, Chimney, Rod	3s. 8d.	1·3 per burner
,, . 2	413	—		1s. 3½d.	2·0 ,, ,,
,, . 3	218	2d. per burner			2·0 ,, ,,

Reference to the files of our Technical Journals, however, affords us additional information; and where details of costs are given, they appear to show that a revenue of 1s. per burner per quarter is necessary to cover actual costs. No doubt this will be reduced as the incandescent system of lighting and its maintenance grows in favour with the gas-consuming public. In fact,

TABLE A.

—	1	2	3	4	5	6	7	8	9	10
	No. of Incandescent Burners.	Average No. of Mantles used or supplied per Annum.	Cost of Maintenance.	Make of Burners used.	Make of Mantles used.	Kind of Lantern in use.	If Governed or not, and Governor used.	Method of Lighting Lamps, Flash Light, Bye-Pass, or Otherwise.	Cost of Lighting, Extinguishing and Cleaning and Repairing Lamps, per Lamp per Annum, not including mantle maintenance.	If Anti-Vibrators are used, and make.
1	1,454	8·2	4s. 4d.	York. Nos. 3 and 4 Kern.	Superior.	Bellamy and Own.	Peebles.	Flash and Torch.	1 Burner, 20s. 2 Burners, 23s. 2d.	Bellamy.
2	1,140	6·3	3s. 7¾d.	Kern.	Welsbach.	Welsbach.	Not governed.	Simmance and Abady and Flash.	14s. 6d.	Welsbach.
3	200	7·0	—	No. 2 Kern.	Voelker, Veritas, Welsbach.	Ordinary Adapted.	Not governed.	Bye-Pass.	16s.	Not used generally. Welsbach heavy occasionally.
4	19	5	5s.	No. 3 Kern.	Welsbach.	Special.	Borrodaile.	Simmance and Abady.	8s.	—
5	291	5·25	2s. 2¼d.	Kern.	Various.	Waddington and Ordinary.	Not governed.	Simmance and Abady.	14s. 6·7d.	A.V.I.L.
6	204	12	10s.	Welsbach "C"	Welsbach Pilot.	18 ins.	—	Torch.	—	A.V.I.L.
7	30	5	—	Welsbach and A.V.I.L.	Welsbach.	Welsbach.	Welsbach.	Bye-Pass.	—	A.V.I.L.
8	286	12	5s.	Kern and Sugg.	Welsbach and Sugg.	Various.	—	Simmance and Abady.	16s. 6d.	Not used.
9	92	2·75	7s.	3 and 4 Kern Voelker.	Welsbach and Sugg.	Waddington and Ordinary.	Borrodaile.	Flash and Bye-Pass.	15s. 10d.	Welsbach and A.V.I.L.
10	785	6·7	—	Welsbach No. 4 Kern.	Welsbach and Bray.	14 ins. × 16 ins. ordinary square.	Bell.	Flash, Simmance and Abady.	—	A.V.I.L.
11	581	3·8	—	Welsbach "C" and Kern.	Welsbach.	45 Welsbach.	Borrodaile.	Chiefly Bye-Pass.	—	A.V.I.L. and Welsbach.
12	1,899	8	5s. 1·82d.	Welsbach "C" No. 3 Kern, Sugg.	Various.	14 ins.	Peebles.	Flash and Bye-Pass.	22s. 11·9d.	Not used.
13	160	12	8s.	No. 4 Kern.	Welsbach and Veritas.	Waddington.	Peebles and Borrodaile.	Flash.	10s. 9d.	A.V.I.L.
14	320	9 to 10	11s.	No. 4 Kern.	Welsbach.	Own.	Borrodaile 4 feet.	Flash.	15s. 6d.	Welsbach.
15	207	6·4	5s. 2d.	Welsbach "C" and Kern.	Viaduct.	Welsbach.	Borrodaile.	Bye-Pass and Torch.	18s. 4d.	A.V.I.L.
16	314	6·6	2s. 5d.	Welsbach "C," Kern, and Self-Intensifying.	Various.	Waddington, Welsbach, and Bray.	Peebles.	Flash and Bye-Pass.	23s. 8d.	A.V.I.L.
17	31	10	10s. 8d.	Welsbach "C."	Welsbach and Lucas.	Various.	Governed.	Torch.	19s.	—
18	250	8	2s. 9d.	Welsbach "C," Kern, and Sugg.	Welsbach and Sugg and Bray.	Waddington and Sugg.	Welsbach and Sugg Governors.	Flash.	13s. 4d.	Sugg and A.V.I.L.
19	197	7	2s. 7½d.	No. 4 Kern.	Welsbach No. 4.	Welsbach Shadowless.	Simmance and Abady.	Simmance and Abady Flashlight.	10s. 11d.	Welsbach.

some of the charges made are evidently based upon this idea—*i.e.*, to foster the business, even at a loss for the first year or two, remaining satisfied meanwhile with the indirect advantages of the system.

It is noticeable that the carrying out of this class of work is practically confined to the gas companies; and no doubt they, from their private capacity and consequent freedom from restraint, are the proper pioneers of such a movement. At the same time, it is quite as important a matter to a corporation gas committee. Over twelve months ago, this question of maintaining private burners was suggested to a Society of Plumbers in a Lancashire town; but after much debate on their part, although all the information at the engineer's command was offered to be laid before them, they could come to no definite conclusion or frame a scheme. Now it is expected that they will not oppose the gas department, but, if necessary, will fall into line.

There is, however, a difficulty in connection with such an undertaking which does not occur in relation to a company when arranging the scale of charges; and though it may be called sentimental, yet it is very real—namely, the feeling on all sides against using what is called public money, even if for the furtherance of the town's most paying business, for purposes which may interfere in the slightest degree with the town's tradespeople. Yet it is absolutely necessary, in view of the largely increasing use of gas for heating and power and the competition even now being met with, not so much from power gas in bulk supply companies as from the producer plants largely sent out for use with gas-engines and for other purposes, that the price of gas per 1000 cubic feet should be greatly reduced; and one of the principal steps suggested to this end is the lowering of the standard of illuminating power, with the consequent saving in cost.

But this cannot be done in many towns in this district until incandescent lighting has become general. In order to become general, it is certain that the gas suppliers must follow their commodity to the point of ignition, and that the charge for such service shall be the lowest possible. How can the latter be arrived at by the corporation engineer, and still at the same time not interfere with the local tradespeople? Taking the fact that it will cost him a sum of (say) 3s. per burner per year, and that he charges 9d. per burner per quarter (the actual cost), he knows that the consequent better attention to consumers' lights, and the quicker opportunity of discovering anything wrong in the supply, will alone bring in a small profit from the diminution of complaints and the natural saving in wages. For instance, a complaint received the other day of "bad lights" was found to be due to nothing else but defective mantles and dirty burners. But how can the local plumber be expected to carry out similar work for such a sum, with probably a smaller number of lights to attend to annually, with the same standard of efficiency. This is the difficulty which corporation engineers must settle; and one of the points which it is hoped will be fully discussed.

It might be done by the corporation obtaining the whole of the necessary material and acting as senior partner in a firm of "Gas Department, Plumber, and Co.;" as by so doing they could probably get special discount terms. The district could be divided out among those interested, with a view to reducing walking time to the lowest possible limit; and the corporation could keep in their show-rooms the latest types of burners, &c., for the information, not only of the general public, but also of the plumbers themselves. New business and installations could be left as far as possible to the trade, and the whole be under the supervision of a competent man appointed by the corporation; the charge to the consumer to be the actual ascertained cost. By this means, the department would get less expenditure on complaints, with increased and pleasanter business; the consumer better lights and more satisfaction at a minimum of cost; and the plumber an incentive to look for new trade, and an opportunity to increase his old, while at the same time securing a small annual retaining fee from the corporation, if thought advisable or advantageous, which could easily be afforded out of the indirect savings.

No doubt other methods than this (which is simply a suggestion) of overcoming the difficulty may strike the members; and it is hoped that they will do their best by giving their views to assist the Manchester District to a sound, fair, and workable scheme.

Turning to the table on public lighting (p. 541), one is struck by the large differences in the number of mantles required annually. Of the 19 towns represented, the lowest is 2·75 and the highest 12 per burner; while the average is about 7·5. To what is this due? Of the four examples—three of 12 each, and one of 2·75—the districts are somewhat similar; the class of burner, type of lantern, &c., will hardly account for the difference; while as to governors, both one of the highest and the lowest use the same, and only one does not employ them—a similar fact applying to the question of anti-vibrator. Is there any difference as to the period of efficiency at which the mantles are changed? And, if so, what should this period be? The agreements made in France lately, and described in the "JOURNAL OF GAS LIGHTING" for Nov. 3 last (p. 281), give the changing point in one case when the mantles have lost 66 per cent. and in another 50 per cent. of their power. Is the same care exercised by the men when cleaning or lighting and extinguishing? Some reason there must be; and if the efficiency point of changing is practically the same, then those who are higher will need to study the system of the lower one with a view to more economical working.

Mr. Helps, of Nuneaton, in a communication to the "Gas World" in July, 1902, drew attention to five important points governing this question—viz:

1.—The standard of efficiency governing the maintenance.
2.—The way in which the service is laid and the connection made to lantern.
3.—The foundation on which the column rests and its proximity to continual or heavy road traffic.
4.—The lantern used, the burner employed, and whether the latter is protected by an anti-vibrator.
5.—The frequency of cleaning.

It will be seen, by reference to the table, that only points 2 and 3 are not covered; and it would be instructive to know from the engineers concerned what steps they have taken to ascertain the effect of differences on these two points, when points 1, 4, and 5 are practically of identical value.

TABLE B.—*Incandescent Lighting.*

Twelve Best Lamps.

No. of Lamp, and Where Situated.			Remarks.					
No. 1586	Hillgate	Wall	5	Mantles.	73	Days per Mantle.		
,, 634	Union Road	Bracket	4	,,	91	,,	,,	
,, 631	,,	Wall	2	,,	182	,,	,,	
,, 629	,,	Bracket	4	,,	91	,,	,,	
,, 623	Market Place	Pillar	4	,,	91	,,	,,	
,, 1142	St. Petersgate	Pillar	4	,,	91	,,	,,	
,, 1132	,,	Pillar	4	,,	91	,,	,,	
,, 1125	,, Bridge	Wall	3	,,	122	,,	,,	
,, 1124	,, ,,	Wall	4	,,	91	,,	,,	
,, 1118	,, ,,	Wall	4	,,	91	,,	,,	
,, 932	Castle Street	Pillar	5	,,	73	,,	,,	
,, 1594	Portwood	Wall	3	,,	122	,,	,,	
Twelve Worst Lamps.								
No. 164	Portwood	Pillar	14	Mantles.	26	Days per Mantle.		
,, 212	,,	Pillar	16	,,	23	,,	,,	
,, 217	,,	Pillar	22	,,	16	,,	,,	
,, 1299	Wellington Road, S.	Pillar	15	,,	24	,,	,,	
,, 1590	,,	Pillar	16	,,	23	,,	,,	
,, 1393	,,	Pillar	14	,,	26	,,	,,	
,, 1212	Greek Street	Pillar	14	,,	26	,,	,,	
,, 1213	,,	Pillar	18	,,	20	,,	,,	
,, 1235	,,	Pillar	14	,,	26	,,	,,	
,, 929	Castle Street	Pillar	14	,,	26	,,	,,	
,, 966	,,	Pillar	14	,,	26	,,	,,	
,, 1063	,,	Pillar	15	,,	24	,,	,,	

Out of 136 lamps used in Stockport of which there are particulars covering a full twelve months working, the twelve best took 3·83 mantles per annum, and the twelve worst 15·5. Of the former, six were short pillar lamps fixed on walls of urinals, &c.—the service being buried in the wall; two were bracket lamps fastened to buildings; and four were ordinary pillars erected close to the kerb. Of the latter, all were ordinary pillar lamps. The best were apparently in one zone, and the worst in another. But one remarkable exception is lamp No. 932, which, as one of the best (five mantles only), is in the area occupied by the worst. Lamps Nos. 929 and 966, on either side of it, have in the same period taken fourteen mantles each.

Such an anomaly as this causes reflection, and would point to the fact that other considerations have to be taken into account which will affect the life of mantles much more than anti-vibrators, protectors, or even ventilation. That Mr. Helps's points Nos. 2 and 3 are most important appears to be shown further by the fact that eight of the twelve best lamps are fixed away from the kerb and upon structures which assist in taking up and killing the vibrations caused by heavy traffic on paved streets. This being so, would it not be as well to arrange for all lighting to be carried out by means of brackets (ornamental where necessary) suspended from buildings? Such a system would not only be a convenience to pedestrians from the absence of obstacles in the foot-way, but an economy in erection and maintenance. It is not an unusual occurrence for persons who ought to know better to try their strength upon the pillars in order to see whether they can smash both mantle and chimney. Lamp No. 631, which shows the lowest requirements, is in a street where there is little or no traffic, although it is very narrow and draughty. Moreover, it is fixed upon a boundary wall. Nos, 1118, 1124, and 1125 are also in a very exposed situation, as far as wind is concerned—being fixed upon the piers of a bridge.

The cost of maintenance again varies very considerably, not always following the proportionate number of mantles used—as, for instance, No. 10, taking 2·75 mantles per annum, works out at 7s. per annum; while No. 8, with twelve mantles, pays only 5s. per annum. If light could be thrown upon these variations, differing from 2s. 2¼d. in the case of No. 5 to 11s. in the case of No. 14, much benefit would undoubtedly be derived. (It may here be stated that the Sub-Section has not yet had a meeting to discuss these various points; but the figures may be taken as accurate, inasmuch as they have been referred back for correction several times.)

As regards the cost of lighting, extinguishing, and repairs, these show very little variation of moment when the lighting hours are taken into consideration; thus proving that the standard rate of pay and work is pretty uniform—only two, Nos. 12 and 16, being abnormal. In the case of No. 16, this is due to the fact that the cost of altering the lamps, &c., to the new system is paid for out of revenue, and included in the cost per lamp.

In conclusion, the following points will well repay discussion:

Whether pilot lights, patent lighting arrangements (such as Green's, Menier's, &c.), or flash lights are the most suitable. Experience of several of the spring types fixed on the outside of lanterns appears to show that more rough vibration is set up, and damage done, through the necessity of overcoming the pressure of the spring, than by opening the door.

Is it advisable to remove the mantle from the lantern when cleaning, or is it generally found that the men are sufficiently careful?

Are governors necessary or does the regulation of the nipple, as in the Kern, suffice?

Does not trusting to the nipple or working without a governor mean diminished light at low pressure through the mantle not being covered, and better light at high pressure with waste of gas, or proper light at low pressure when the mantle is nicely covered, and waste of gas and diminished light at high pressure by reason of the gas flaring above?

Would it not appear that, in order to get the best lighting results, the burners should be tested before leaving the works, and regulated both as to governor pressure, gas, and air to the most efficient point? It is certainly necessary to use care with governors, as trials which have been made showed variations from 4·1 cubic feet at 15-10ths pressure to 5·3 cubic feet at 25-10ths pressure; while others of the same make, presumably set at 4 cubic feet, have passed on test as much as 6¼ cubic feet. Burners also have often been found which had been so carlessly regulated before leaving the works that they did not pass the requisite quantity of gas, and would not fill the mantle; others, proportioned to give so short a flame as only to affect about two-thirds of it.

In the burners given in the tables, when turned out from the makers' works, the proportions for air and gas are fixed definitely. Has anyone noticed the effect upon the light given by varying qualities of gas? Does not experience show the advisability at any rate of having some means of adjustment provided so that due regulation may be made conveniently and easily?

TABLE C.

No.	Nationality.	Number of Days.	Number of Mantles.	Average Number of Days.
1	English	117	31	3·77
2	English	381	31	12·29
3	German	1157	54	21·42
4	English	629	46	13·67
5	English	1118	49	22·89
6	German	223	22	10·13
		201	24	8·37
7	English	108	16	6·75
8	English	230	18	12·72
9	German	414	49	8·44
10	German	439	53	8·25
11	German	354	28	12·64
12	German	390	30	13·00
13	English	841	47	18 00
14	English	127	11	11·54
15	English	Large Quantities		40·00

The class of mantle in use shows very little variation from the standard; but as incandescent lighting is yet in its infancy as regards its proportions, would it not be advisable for tests of various types and makes to be made? Because, both for private and public use, the one that gives the best and cheapest result is the one which should be sought for and kept continually in the fore-front. At the same time, care must be exercised, and due note taken of the conditions of testing—too much reliance upon the result of a single test being avoided. This is shown to be necessary by the fact that a type of mantle of foreign make (No. 3 in table), half-a-gross of which were tried on the public lamps at one period of the year, only averaged a life of 21·42 days each; while a further half-gross reached an average life of 59 days each. The tests in the former case were made in January and February; and in the latter, in May of the same year. The method at present employed is to stock a number of different makes; those required for replacement each day being taken in

turn according to the number wanted, the finishing point of the previous day being the commencing one of the next.

At the risk of repetition, mention must again be made as to the method of erecting the lamp-pillars. What is the system employed by those showing the best results? And does not the cost of maintenance and renewals of mantles really depend more upon this than almost upon anything else? At the present time, we are adopting a large foot-plate to the pillar, resting it upon a concrete flag made with cement and our own clinker and ashes or broken bricks; and, in addition, we propose to use some partly elastic material, such as bitumen, to insulate the column base from the flags, and the service-pipe at the top from the pillar itself. Due note will be made of the result.

Much more might be added on this interesting subject—such as the proper position for bye-pass lights, the effect of not turning these out when the burner is full on, the value of hanging lamps as against the ordinary type, and many other points. But I feel I have trespassed on the time of the meeting quite long enough; and if the object with which this paper was prepared—namely, to obtain the experience of everyone on the subject—be fully achieved, much beneficial information will have been added to the records of the profession, and great assistance afforded to the many interested in the advancement of the gas business on sound and lasting business lines.

THE DISCUSSION ON THE MANCHESTER INSTITUTION PAPERS.

The two foregoing papers, by Mr. Mottram and Mr. Meunier, having been read,

The PRESIDENT (Mr. S. R. Ogden) said both the papers were very interesting, from more than one standpoint; and they ought to elicit a good discussion. He would reserve what he had to say till later.

Mr. H. TOWNSEND (Wakefield), as Mr. Mottram's next-door neighbour, wished to have the privilege of congratulating him on what he believed was his first paper contributed to that or any other Institution. It opened up a wide field for criticism and the interchange of experiences. He should like Mr. Mottram to say, in the first place, how many cubic feet of gas he gave for 1d. in the slot meters, and also what was the average consumption per meter per annum. At Wakefield, on the 30th of June last, they had 4349 slot meters. Their consumers were drawn from a very poor class of people, mostly miners—so poor that they would not have cooking-stoves, though offered to them absolutely free. Their average consumption was 7075 cubic feet per annum; the price of the gas by the ordinary meter being 2s. 6d., and by the slot meter 2s. 7d. per 1000 feet. The meters were set to give 22 cubic feet for a penny. This price was fixed when gas was 2s. 8d. per 1000 feet; and when it was reduced to 2s. 6d., the price by the slot meters was not altered, but 2d. was given back to the consumer. This was found to be very useful when the money in the meter was short; and the consumers were very pleased with it when it was in excess, because, as a rule, the man put the money in, and the woman got the excess money back. To give an idea as to whether the small consumption of 7075 cubic feet per annum would pay, he might say that they had a block of 23 houses to fit up last year, and he took particular notice of every detail of expenditure. He found that the cost per house came to £3 7s. 7d. for the service, main cock, slot meter, pendant, breakfast cooker, double tube, cock, and length of braided flexible tubing. It was found that the cost of collection was 1d. per 1000 cubic feet more than with the ordinary meters; and 1s. per 1000 extra on a consumption of 7000 cubic feet per annum yielded 10·35 per cent., which was an adequate, but not an excessive, return upon the capital expended. In another part of his paper, Mr. Mottram gave a specification for internal house pipes and fittings. He (Mr. Townsend) would like to have had particulars of the specification; and he thought if Mr. Mottram had given these details in his paper, it would have added greatly to its value, because then they could all have discussed them, and perhaps from the combined experience of the meeting they would have been able to arrive at the proper system to adopt. With regard to what Mr. Mottram had stated about doing the work of the plumber, he might say that in Wakefield they were very reluctant to interfere with the plumbers' and gas-fitters' business, and so far they had not undertaken this class of work; but it was found that these people did not push it sufficiently. The plumber and gas-fitter did not canvass customers, while the suppliers of electric light fittings did; so that he was afraid they would be reluctantly compelled, in the interests of the gas undertaking, to carefully consider whether they should not follow Mr. Mottram's lead, and take the business into their own hands. Mr. Mottram had referred to the additional risk that would be undertaken by the Company in fitting up houses. Of course, there would be a very greatly increased risk, because if any of their fitters happened to leave an escape of gas which led to the house being burnt down, the Company would be responsible. In Wakefield, they had taken this fact into consideration, and had thought it prudent to insure against third-party risks. They had insured for a sum of £500, for which they had to pay a premium of £7 10s. per annum. No doubt this was a very heavy fee; but it would be reduced as the thing became better known. For the £7 10s. they were insured for £500 for twelve months; but no individual claim was to exceed £250 in any one year. With regard to Mr. Meunier's paper, he found there a table of private lighting maintenance; and perhaps it would be useful if he gave his figures, as, though he was not in Mr. Meunier's district, he had had some experience in the matter. In Wakefield, they had 220 burners, the charge being 4d. per burner per month—supplying mantle, chimney, and rod. The cost of the burner per annum came to 3s. 8¼d., and of the mantle to 5·3d. per annum. At this rate they lost in the first year £10 19s. 4d.; and the second year they made a profit of 13s. 9d. The price was now reduced to 3d. per burner per month, and to 2d. where more than six burners were used. For churches, they charged the actual cost price for mantles, &c., and they were not included in the figures he had given. With regard to Mr. Meunier's second table (Table A), in Wakefield the lamps were looked after by the Corporation, and therefore, of course, he had no figures of his own to give; but Mr. Fordham, the Corporation Lighting Inspector, had very kindly furnished him with the particulars he was able to supply. It appeared that in Wakefield the number of incandescent lamps was 323, and the average number of mantles used per annum in 1901 was $3\frac{1}{8}$, and $4\frac{5}{8}$ in 1902. These figures compared very favourably with those given in Mr. Meunier's table; in fact, they were almost the lowest. It was only right to say that the mantles were not renewed quite so often as he should wish to see them; but the Corporation Lighting Inspector was afraid that if he renewed them as frequently as he should like, the Electric Light Committee would use this as an argument for substituting electric lighting for gas. The cost of maintenance in Wakefield was 2s. in 1901, and in 1902 it was 2s. 5d. This was absolutely lower on the two years than any figure that Mr. Meunier had given in his table. On this point, he should like to ask Mr. Meunier whether, in the cost of maintenance, he had included labour, or only the material. In his own figures, the cost of material only was taken account of.

Mr. MEUNIER said in the cases he had given the labour was taken into account, including the man's time going backwards and forwards to attend to the lamps.

Mr. TOWNSEND (continuing) said the burners used at Wakefield were No. 4 Kern and Sugg's, the mantles were Welsbach, the lanterns were Welsbach and Sugg's, and the same with the governors. The method of lighting was by the Simmance-Abady torch; and if anti-vibrators were used, they were Sugg's and the A.V.I.L. Mr. Meunier stated that, in his opinion, the cost of maintenance would be lessened if bracket lamps were used instead of pillar lamps. In Wakefield, they had one street entirely lit with bracket lamps; but it was found that the cost of maintenance in this street was quite as heavy as, if not heavier than, in streets where pillar lamps were used. It had been found that governors were absolutely necessary; and one was fixed on every incandescent lamp. In Wakefield, traction engines drawing heavy loads passed continually through the streets and over bridges that were lit by incandescent lamps; and in these cases it was found necessary to use the A.V.I.L. frame—the ordinary anti-vibrator that was supplied not being sufficient to compensate for the heavy class of traffic. With the A.V.I.L. frame, it was found quite effective; and the mantles lasted very well indeed, notwithstanding the tremendous traffic. Special pains had not been taken to isolate the lamp-pillars; and they had what they considered fairly favourable results without doing so.

Mr. W. WHATMOUGH (Heywood) said Mr. Meunier had given the figure in one instance of 2s. 2¼d. as the cost of incandescent lighting. Did this mean only the mantle?

Mr. MEUNIER replied that it included the mantle and the labour; the time of the man being reckoned in.

Mr. TOWNSEND said his figure included the mantle, protector, and fork; but not the labour.

Mr. WHATMOUGH said, in his case, the charge of 1s. 3½d. per burner per annum for private lighting maintenance, which was very low, included chimney, shade, globe, and man's time. His average cost was taken on 113 burners; but they had at the present time 413 burners in use. They charged 1d. per burner per month; the consumer paying the cost. But it was found, after twelve months' experience, that many were giving it up and doing it themselves, which conveyed to his mind that it was far better to have the two systems in operation—either to take the whole thing, or let it be optional to the consumer simply to have the burners inspected. On the question of doing their own plumbing, he might say that when he had started this business the plumbers in the town met in solemn conclave; and after two or three meetings a deputation was appointed to see him. The matter was fully discussed between him and the plumbers; the latter being quite satisfied as to the conditions on which he was working. No question had been raised with regard to the maintenance. Turning to Mr. Mottram's paper, he should be very pleased if that gentleman would give him the capital outlay of his installation, and also state whether he had applied to the Local Government Board for borrowing powers to carry out the work; and, if so, what time was fixed for repayment. The other matters he wished for information upon were, the amount Mr. Mottram allowed for depreciation of his fixtures, the average consumption per meter, and the price charged to ordinary consumers. He should also like to know what was the best thing to do in cases where a loss was incurred over a slot meter—whether it would

not be better to remove the meter as quietly as possible. There was no doubt that many in his district did not pay—the average consumption being only 6400 cubic feet per annum.

Mr. C. ELLIOTT (Leyland) asked Mr. Mottram if undertaking the inspection of internal fittings involved any extra responsibility. He thought Mr. Mottram's working, which was something like his own experience, was on the right lines. The fitting up of slot-meter installations was the work of the company or the corporation, as the case might be; but he thought putting up new fittings should be the work of the plumber. Undertaking internal fittings by the company seemed like going back to the old idea of having control of the gas from the retort to the burner. In his opinion, if they made friends with the plumbers in their respective towns, it would help in the consumption of gas.

Mr. H. HAWKINS (Todmorden) said, on the question of internal fittings, he did not think Mr. Elliott had had the same experience as he had, because he had found that the plumbers were not to be relied upon. They had had many complaints of leakages in fittings; and when these came to be investigated, it was found that the plumber had done the work by contract. He had put in a ½-inch compo. pipe, which was said to be large enough for any light; and, to avoid the expense of making a proper joint, he had simply bent the pipe round and plastered it up with white lead or soap. In the next place, complaint was made that there was an insufficient supply of gas. Of course, the Committee were blamed for it; but when they came to look into the matter, they found that the pipe was almost twisted off, and so bent that the gas was unable to get through, and therefore there was considerable leakage as well. In some cases, they found the pipe completely twisted off. He quite agreed that the inspection of internal fittings was absolutely necessary; and if the plumber could not be relied upon to carry out the work fair and straight, the Gas Committee should do it themselves right up to the burner.

Mr. J. H. BREARLEY (Longwood) said he was fully alive to the importance of the technical bill of fare that had been submitted to the meeting that afternoon. The papers had both been very creditable productions; but as some of the technical journals had been recently deploring the time spent in paying compliments to readers of papers, he would not say anything more on that point. Mr. Meunier's paper bristled with ideas; the difficulty was to know where to begin in criticizing it. The most important point seemed to be the question of conciliating the plumbers. In his case, they had actually gone to the extent of starting a show-room in a plumber's shop in the village. They reserved to themselves the right to put on exhibition there any kind of apparatus in connection with gas distribution. No restriction was placed upon the plumber's incandescent business, nor was there any upon theirs. They reserved to themselves the right to carry out maintenance, and also internal fitting. The plumber was guaranteed a certain annual profit on gas pipes, stoves, and that kind of thing; and he was allowed to push the incandescent business to his heart's content. So far, he believed, the scheme had been mutually advantageous; and he was seriously contemplating extending the idea by giving the plumbers the benefit of cheap gas (if not entirely free) for show-room purposes, in addition to a certain allowance for mantles. Instead of curtailing the plumber's business, he agreed with conciliating him. In this respect, a lesson might be learnt from the electricians. The greatest touts for electricity were not those who produced it, but firms and individuals who were engaged in fixing up houses with electric fittings. At any rate, this was his experience. In the street lighting table, the number of mantles supplied was stated in the average per annum. In his opinion, it would have been better if it had been stated also in the average per lighting hours or days, in which case the relation between the two could have been seen. As they all knew, the variation in lighting hours was very great. In his own district, one Council lighted for only nine months, while the Corporation lighted for twelve months. This made a great difference in the cost of maintenance. For instance, in the Corporation district, where they had 193 lamps, the average number of mantles used in two years had been nine, and the average number of chimneys was 2¾ per lamp. In the outside area, where nine months' lighting was in vogue, the average number of mantles used was eight, and the average number of chimneys 2⅓. There was not, therefore, a very great difference; but still there was some. In his opinion, the solution of the renewal of mantles problem was the selection of a suitable type of lantern. In one district, he had found that, where the average number of mantles used was a little over six in the twelve months ending June, 1902, it jumped up to ten in the twelve months ending June, 1903. They had come to terms with the Council for replacing all their lamps. They fixed the entire number of lamps (118), and adopted Mr. Mottram's idea of spreading the payment for public lamps over ten years. The Council were pleased with the arrangement; and the Company saved in mantles. In the three months ending Nov. 1, these lamps had used 106 mantles and 42 chimneys. He could sympathize with the managers and engineers who had different types of lanterns. They might describe their lanterns as "ancient and modern"—the ancient being in a great majority. The testing of mantles was a very important point. The difficulty was that they got mantles professedly of the same brand, but entirely different in quality to the last delivery; and he did not see, even if they tested the mantles, how they were to protect themselves against lack of uniformity in manufacture at the other end. Mr. Mottram's paper was full of useful suggestions. As to the average cost of 15s. 1d. per house for slot-fittings, he should like to know whether this included incandescent mantles, and over what time the average was taken. He should also like to know what outlay Mr. Mottram incurred for pendants and brackets, and what was the net cost to the Company. There was some injustice, he thought, in the form of agreement given in the paper. It did not seem to appeal to a Britisher's sense of fair play that the consumer should have to "undertake to deliver to the Corporation when leaving the premises, or on demand, the above articles in good order and condition (ordinary wear and tear excepted), and to replace any of the same which may be damaged while in my possession; at the same time relinquishing all claim to such damaged article or articles." It seemed hardly fair to make the consumers replace a damaged article, and give him no allowance for the damaged article if it was worth something. Would Mr. Mottram tell them whether the Ossett Corporation had embraced the official inspection of gas-fittings in their bye-laws? It seemed to him that it would be much better to have power from Parliament for the inspection of fittings, or, at any rate, in the bye-laws, apart from the authority given by the Corporation. Most companies, on going to Parliament, got a clause inserted authorizing the inspection of fittings. He did not know whether Mr. Mottram inspected the houses personally in every case. If he did, he (Mr. Brearley) hoped the idea would not spread to Longwood.

Mr. R. WATSON (Doncaster) said that both the papers that had been submitted to the meeting were extremely interesting ones, because they were all concerned with what went on inside the houses they supplied, and also with public lighting. So far as the latter was concerned, many consumers judged of incandescent lighting by what they saw in the streets. He had been for some years particularly interested in pushing the fittings business, having been for some time past connected with a Company who were not restricted in any sense in doing a fittings business. They had obtained control of the houses of many of their consumers, with, he believed, the advantage of getting satisfactory lighting for those who had taken gas from them. He had endeavoured, where he was now, to make a start in this direction; but unfortunately the question of municipal trading came in, and his Corporation shrank from doing anything which would seem to be treading on the corns of the traders. He had suggested that they might have an exhibition of gas lighting, quite apart from the cooking exhibition which was held in the summer. They took a hall, and fitted it up with the best forms of incandescent and other burners, having previously called a meeting of all those fitters in the town who cared to join in the exhibition. A certain number responded; and, after allocating to them their share of space, they gave them their own stands. They themselves had a considerable show of fittings and other things, but did not push the sale. They invited the fitters to do what they liked in the way of selling from their stand. The fitters who joined them welcomed the idea very gladly, and said that the Gas Committee were doing the right thing in consulting them, as he believed they were. For a week or two afterwards, something was done in the way of pushing gas-fittings and gas-fires in the town; but unfortunately the consumption of gas did not seem to have gone up as the result. He was convinced that it was the best policy for gas companies on their own account to push the fittings business. In addition, they did what they could to induce the fitters of the town to combine; and they got out a calculation as to the best means of using gas-burners, the effects of coloured globes on incandescent lights, and also the effects of reflection from wall papers, and so on. He was rather personally interested in the subject of Mr. Meunier's paper, inasmuch as he was doing his best to change all the lamps in his district to the incandescent system. He had had some little difficulty with mantle breakages. One could only speak from one's own experience, as the amount of vibration varied; but so far as Doncaster was concerned, he thought that drivers were as much to blame as the lamp-posts or the lampmen. He had often seen men rush to the stand-pipe when going down hill, to pull themselves up. Again, many of the troubles that they had from incandescent lighting were as much due to the lamplighters as to other causes. It might have been of service if they could have had some particulars of the consumption of gas and the burners in use. In Column 7 of Mr. Meunier's table, it was stated whether the burners were governed or not; and it would have been very useful to have had the particulars as to the governors employed. During the present year, he had had a number of meters placed in the town, to see what the consumption had been; and he found that it worked out to a fraction over 4 cubic feet per hour. One of their fitters had put up a new set of burners in one street; and he was congratulating himself on the excellent lighting, when he discovered that the man had forgotten to put governors on. He thought that this would be an answer to one of Mr. Meunier's queries at the end of the paper, as to whether or not it was advisable to use a governor with a Kern burner. From his experience, it seemed an ungoverned burner gave the best light; but he could not say what effect it would have on the cost. He intended to supply some of his other lamps with ungoverned burners, to see what the effect would be. He thought they ought to have some further information as to the cost of maintenance; but he gathered that it included labour. If this were so when it came out at an average cost of 2s. 5d., he did not know what the price of the mantles was; but even at 4d. each, it would be 2s. without the labour.

Mr. R. G. SHADBOLT (Grantham) said it might or might not be true that certain towns, which did not undertake internal fittings, &c., would be behind the times, as Mr. Mottram had stated; but there was one feature of the paper which had particularly struck him, and that was the increased cost, responsibility, and liability incurred. He thought these points warranted serious consideration before they went into the matter to an unlimited extent. With regard to the question of insurance, he had himself made a few inquiries, and he could not find any premium at a lower rate than 30s. per £100 for twelve months. Even in the case of Mr. Townsend, who had fitted up several houses with internal fittings, the liability must be very great, unless his workmen were exceptionally good, such as were not to be found farther south. He thought, with Mr. Mottram, that the figure for insurance premium was very high; and if they were going in generally for internal fittings, and consequently for insurance, as they would be bound to do, they ought to use their influence to get a reduced rate. He had not done any internal fittings; but he should say that Mr. Mottram's figure of 15s. 1d. was far too low for many places, and much below the average. The supplying of internal fittings, the cost of maintenance, the repayment of the capital expenditure, and other items, all tended to add to the price of the gas. The question of the difference between the price of gas supplied by the slot meter and the ordinary meter had already been raised. A great deal naturally depended on what the price that was charged for the ordinary meter covered. In this connection, he would give his own experience. When he was a Manager in Yorkshire, he looked into the question, and found that they could not raise the consumption above 5000 cubic feet per consumer. They charged for fixing the meter, meter-rents, taps, and various other things; and, to cover the cost of collection, the cost of the breakfast cooker, and fixing, they had to put on a charge of 1s. 1d. per 1000 cubic feet, in order to see their money back. At present he had no meter-rents; they fixed the meters free, and made no charge for the taps. Consequently, when they were comparing the cost of the two systems, they had only to add the interest on the outlay for the prepayment attachments, the cost of any fittings they undertook, and the expense of collection of the prepayment meters over the ordinary meters. Comparing the two, he had decided that 5d. per 1000 cubic feet would pay them better than would the 1s. 1d. in the previous case. They had been using the slot meters for five years, and now he found that the total cost of collecting and bagging from the slot meter equalled 1·9 per cent. of the amount collected, or 0·76d. per 1000 cubic feet, and that 10 per cent. interest and depreciation of attachments came to 1·38d. The extra repair of slot meters compared with ordinary meters was also a negligible quantity, amounting to 0·10d. per 1000 cubic feet. This made a total cost of 2·24d. against an extra charge, in many instances, of 1s. or 1s. 3d. This was without the burden of internal fittings. If the case were stated in that way, the question arose whether such a system would be successful. He had taken out the figures, and found that they had 1736 ordinary and 1493 slot consumers, or 55 per cent. ordinary and 45 per cent. slots. In regard to the cookers, they did not supply them free; they were all on the same footing. Here again, the advocate of supplying internal fittings would say: "You will not send out so many cookers as we shall." To the ordinary consumers they supplied 510 cookers, and to the slots 940. In other words, there were 35 per cent. of ordinary cookers, and 65 per cent. of slots; so that it would be seen, from every point of view, that there was as much to be said in favour of his individual case of putting the load on the price of the meter as light as could possibly be done without loading it up with too many fittings. In Mr. Meunier's paper, one thing that struck his mind was this—and several things had occurred lately to drive it home—that stress of competition, and not the relative values of different classes of consumers, as such, was becoming the prime factor in regulating the price charged for gas for various purposes. They had been arguing among themselves what differential prices the consumers were entitled to. In his opinion, this was quite beside the mark. It was outside competition that was going to be the regulating factor before very long. That skilled maintenance was the secret of the success of incandescent lighting, went without saying. The question seemed to be how far maintenance should go, and whether it should be done at a loss, at a profit, or at cost price. The latter, if they could induce their consumers to believe it was cost, and no more, was the most satisfactory to both parties. Having instituted the maintenance system some years ago by charging 9d. per burner per quarter, it was found that people objected to it. They said it was all very well in the winter; but they wanted to know how it would be in the summer, when they had no lights in use. But when they said they would do the work, and charge only at per quarter, the consumer had a big bill in the winter and none in the summer. They had heard of conciliating the plumber; but, in his opinion, they had also to conciliate the consumers.

Mr. BREARLEY asked if a consumer two miles from the works was charged for the time of the man walking to and fro.

Mr. SHADBOLT said they had no such places in their town. There were so many people on the maintenance system, that it would be a very large place in which the consumers were two miles apart. They found it was not necessary to go round more than once a month. It was not the man's time from the offices that should be reckoned, but his time in going from next door, and from there on to the next house beyond. Inside maintenance and street maintenance were two different things; and the period of efficiency was different in each. Under the conditions in which they were working at Grantham, the period of efficiency became an important factor. They were under a contract for three years, and had to supply a certain number of lamps with an illuminating standard of 750 candles, a certain number at 160, and some at 25. They could get a very good margin over this, and could afford to drop on the No. 3 Kern efficiency without rendering themselves liable. They were liable to a fine of 10s. per lamp on every occasion when the illuminating power was deficient, in addition to a fine for every lamp that was found out, although it would be seen that they were pretty well looked after. They were fined so much an hour; and in the long winter nights, when a gale sprung up, it made one roll over in bed, and wonder how much the fines would amount to. Under these conditions, he came to the conclusion that the pilot-light was a snare and a delusion, and that the flash torch-light had proved to be the best. He had also noted the fact that they should be sure that the bottom doors would automatically close. No separate particulars had been given in the paper as to high-power lamp maintenance; but perhaps this was because there were none in use. He had not seen any means by which anti-vibrators could be adapted to them. His experience of five or six years with the old "C" mantles was five mantles a month. With the Welsbach mantles, from an experience of two years, the average was one a month. With the high-power burners, it was found that, though the destruction of mantles was greater, light for light, the cost of maintenance of these mantles was not so high as of the smaller ones. In these intensified lights, the mantles were subject to greater destruction from the flame itself, and from being of such a nature that one could not apply any anti-vibrator. So far as street lights went, from his own experience, "anti-vibrator" on the smaller burners seemed to be a misnomer, because many of them had shown a greater number of broken mantles than those that were fixed against the kerb in very narrow streets. Governors had been the cause of endless trouble and expense. He had not experienced any trouble in selecting such nipples as would work satisfactorily under the conditions in which they were working—under a pressure of from 14-10ths minimum to 24-10ths maximum. They had sufficient margin to allow for it; so that when the minimum pressure was on, they were considerably exceeding the light that was required. They had done away with all the trouble and all the expense attendant on the use of governors. The proportion of air was a point which Mr. Meunier had raised; and, to his mind, undoubtedly the question of the efficiency of the burner depended much more upon its ability to take in air and intimately mix it with the gas, than upon the quality of the gas per candle power. And this ability in turn varied more with the change of pressure at the jet than with alterations in the quality of the gas itself. He was speaking not merely from casual observation, but from tests that he had made. He had known burners of a cheaper description give better light with 15-candle gas of under 500 B.T.U. per foot heating value, than with 17-candle gas of 20 per cent. higher calorific value. That was to say, the proportion of gas and air was more perfect with the lower-quality gas than with the higher. The result was that the lighting effect was not so great. Air adjustment under normal conditions could only apply to the reduction of air introduced into the burner, whereas it was more often an increased proportion of air that was required; and any arrangement that would enable them to regulate the supply of gas at the nipple without reducing its initial pressure, and consequent velocity, would be far more effective. In conclusion, he wished to express his appreciation of the two papers, and particularly Mr. Meunier's, as indicating that the commercial sections were getting at close quarters with their work, and developing in a direction that could not fail to be of great service in the very near future.

Mr. T. BOWER (West Hartlepool) said, with regard to Mr. Meunier's remarks as to the possible discrepancy in the number of mantles used per annum, he might mention that at the present moment, along with the Engineer of the town in which he resided, he was making experiments on 500 of the public lamps, to which were being attached an automatic controller appliance. This apparatus had been fixed to 500 of the ordinary street lamps in the centre of the district; the object, of course, being to dispense with lamplighters. Since they had had this apparatus in working order, their experience had been that, with the same lamps, except that one had the apparatus and the other was without it, they had had as much difference in the number of mantles used as to be nearly equal to 3 to 1. To be exact, in the lamps that had not the apparatus and had to be lighted with the torch, they had 2·8 mantles used for every one in the lamps fitted with the apparatus. He thought this conclusively proved that the lamplighters themselves had a very large influence on the figures in Mr. Meunier's table. Of course, they were only in the first stages of their work; and, no doubt, after the matter had been impressed on the lamplighter, the figure of 2·8 might be materially reduced. But from his own observation, he was perfectly satisfied that, if they were to continue with the old system of torch lighting, they would have fully double as many mantles to provide as with the apparatus. He did not know that he could claim the whole of the difference for the apparatus. There was another little point to be observed; and that was that they had had to alter the arrangement of the cock for lighting, in order to suit the apparatus. The lanterns, however, were the same; and in all other respects, except this alteration, the conditions were alike. With reference to Mr. Mottram's paper, he quite thought the day had gone

past for looking upon the slot-meter system as an experiment. It was five years since they had introduced it in West Hartlepool; and during that period they had fixed at the rate of 1000 a year. In the first instance, they provided the meter fittings (not the pipes) and a small griller. The charge was based on the assumption that, when introduced, they would get a return of 8000 cubic feet per consumer. The installation cost £3—that was, meter, fittings, and everything except the service. A difference of 9d. per 1000 cubic feet would give them 6s. per annum over the extra price, which was equal to 10 per cent. upon the gross outlay in the first instance. He might say that an average over the last four years gave them an actual consumption of 9600 feet; so that they had actually realized more than they had set out to obtain. Therefore, they were perfectly satisfied with the system, and would be sorry to be without it. It was true that there were many little points of inconvenience and extra cost connected with it, but, at the same time, they were such as might be readily overcome; and he thought now that every effort should be made to encourage this class of consumption. He was perfectly sure, from his own experience, that it was worth the attention of all gas companies, and would be remunerative.

Mr. G. S. FRITH (Frodsham) noticed that Mr. Meunier said: "Would it not be as well to arrange for all lighting to be carried out by means of brackets?" On this point, he would like to ask Mr. Meunier what sort of brackets he would recommend for a street 150 feet wide. He thought bracket lamps would look rather peculiar in a street of that size. Still, if Mr. Meunier could suggest one to him, he should be very pleased to consider it.

Mr. W. W. HUTCHINSON (Barnsley) asked Mr. Meunier if he charged the slot installations to capital or revenue. He also wished to call attention to the action of cleaning the lamps, and the jar caused to the upright pipes in districts where the anti-vibrator was not very efficient. He thought this matter had escaped attention. He wished to bear testimony to the care and attention both readers of the papers had given to the subject.

Mr. J. H. BUCKLEY (Formby) asked what Mr. Mottram put on to the price of the gas for his slot-meter installation. He saw no reference to this in the paper, and thought it would be a useful item of information for those who were about to embark upon the slot-installation business. By way of experiment, he had had a few fitted up; and the average cost ran out at about £5 per house, which was a totally different sum to the 15s. 1d. given by Mr. Mottram. He might say that his figures included the service to the meter; and he had put on 10d. per 1000 cubic feet. The consumption bid fair to be a success. It averaged about 12,000 cubic feet per annum; and, worked out at 10d. per 1000 feet, it gave them 10s. per installation. This was a fair interest on their outlay, and a fair sum for depreciation. It would be useful to have the complete cost of the service and the installation. He should like to ask Mr. Meunier if, under Table B, he adopted the ancient or the modern lamp? If the modern, what particular make and what kind of anti-vibrator?

Mr. MEUNIER said the tabulation gave the anti-vibrator, and also the lantern.

Mr. BUCKLEY said it did not give the town.

Mr. MEUNIER said he was afraid he could not do that; but he would give them his own town. If they looked at No. 14, that was Stockport.

Mr. BUCKLEY said, on the question of the utility of the anti-vibrator, it had occurred to him while reading the paper that it would be a good idea for any manager of works who had lamps under his care to try what effect it would have upon the life of the mantles if the service up the pillar were severed at the base, and coupled up with a rubber tube, so as to reduce, as far as possible, the effect of the heavy traffic.

Mr. H. KENDRICK (Stretford) said his Company did nothing in the way of fitting up houses; a considerable portion of this work was done for them by plumbers in the district under contract. They supplied seven different centres of population; and they let out by contract for two or three years at a time all their outside work to various plumbers, giving them in turn one contract in each district. They supplied all meters free to the ordinary consumers; but the latter had to pay the cost of fixing. In the case of prepayment meters, they gave a free supply with a griller, and just a rubber connection, and also a brass connection to fix to a bracket. For this, they charged 7d. more than the ordinary price. The inspection of fittings had been carried on in the Manchester district for many years. His Company had done it for more than twelve years; and it was done without any special Act of Parliament previous to 1899. That year as they had to go to Parliament, it was included in the Bill; and now they had parliamentary authority for going right up to the point of consumption. By reason of having an agreement with the plumbers to do the work for them, they had no trouble with them. To show the necessity of exercising some supervision over the plumbers themselves in their work, he had just taken out a list of the number of complaints which were inspected and investigated during the months of October and November last year and this year, which was found to be the greatest season for complaints. He found that they had investigated 142 complaints. Out of these, 12 were defective incandescent burners, 38 defective ordinary burners, 38 defective fittings, 32 defective service-pipes and meters, 5 defective governors, and 17 people said the gas was bad. With regard to the latter, of course, they could find nothing at all wrong; but he should like to add that most of these people had incandescent lights in one part of the house and ordinary burners in the other, and it was in the other rooms that the gas was bad. They drew the inference that the people had got used to the incandescent burner; and therefore that the flat-flame burner was bad in illuminating power. With regard to differential prices of gas, following the example of the worthy President of the Manchester Sub-District, he went into that pretty closely. Although he had not taken his Directors with him as far as he wished, or as far as some of the others had done, yet he had persuaded them to make a considerable difference in the price of gas for ordinary consumers. They now supplied gas at a differential rate up to 7d. per 1000; and by this means they had secured one of the biggest individual consumers in the Manchester district. These people had been thinking of putting up producer plant for themselves; but by dropping their price, they had secured them, and at the same time a consumption of 25 millions per annum. The initial price was 2s. 9d. per 1000 cubic feet; and these people were supplied at 2s. 2d. He had just taken up the incandescent maintenance business, and had adopted the two-price system, which was that they looked after the burners at 2d. per burner per quarter (including keeping the chimneys clean), and maintained the mantle in addition for 8d. They started this work on Oct. 12; and the previous day they had 99 consumers on their books, with a total of 568 burners. He did not think this was finality at all, because he had found that, out of 8500 consumers, they had over 3000 who were using incandescent burners. Out of the 568 burners, their inspector reported that over 80 per cent. were inefficient and dirty—a great proportion of them even lighting-back. So much was this the case, that some of the consumers were thinking of reverting to the ordinary flat-flame lighting. Though they had not taken up the supply of fittings themselves (the offices being on the works, in quite an out-of-the-way place), the mantle business was driving them into the fittings business; and they had fixed something like 200 additional incandescent burners in the course of the last few weeks. With reference to the public lighting, the mantle account would appear rather heavy, because the whole of the public lighting was in the hands of the different Councils they supplied; and all they had to do was to look after their mantles. Lamplighters, having no interest in keeping them in good order, were not particularly careful in lighting the lamps or cleaning them. They had made attempts in two of their largest districts to get the Councils to leave the lighting in their hands; but they had failed in this, because the authorities found that they wanted to get rid of some of their lamplighters who had been with them thirty or forty years, and put on men who were thought to be more proficient. The last point he wished to refer to was one which Mr. Meunier had raised, and it was the outcome of a few tests they had been making during the last few days. They had found that with 16-candle gas in a No. 4 Kern burner, and with five different makes of mantles, they gave practically concordant results, from 19 to 19·9 candles per foot. This was the average of a considerable number of tests; but unfortunately it was done with the ordinary bar photometer, and not with a "Flicker," as he had not been able to persuade his people to have that kind of apparatus. When it came to a higher candle power, which was a mixed gas, two-thirds coal gas and one-third water gas, the same mantle gave only 16·4 to 16·9 candles. There was no alteration in the air supply, and no alteration of the nipple. On a "C" burner with an 18-candle mixed gas and mantle by the same maker, the averages were 14 candles to 14·2 candles per foot. This pointed very much indeed to the necessity of examining the burners and testing them before they tried to see when they gave the best result, more especially with regard to the air supply.

The PRESIDENT said, on the question of companies and corporations taking the work of fitting, &c., out of the hands of the plumbers, he would remind them that many corporations would have to get a bye-law for the purpose. At the request of a publican in his town, he fixed a burner for him; but, unfortunately, at this very public-house the plumbers held their club. They raised the question at their first meeting afterwards, as to the person on whose authority it had been fixed; and he told them he gave it, not with the idea of taking the work out of their hands, but to show what could be done by the incandescent light in similar positions. He also pointed out that the plumbers had had ample opportunity of taking the matter up, and could have had any information they wanted, if they had applied for it. The upshot of the meeting was that it was distinctly said that in future no work of a plumbing nature should be done by the Blackburn Corporation, but that it should be left in the hands of the plumbers. The papers and the discussion thereon could not fail to be of benefit to all who had heard or would read them.

Mr. MOTTRAM, in reply to Mr. Townsend, said at Osset they allowed 20 cubic feet of gas for 1d. The average consumption worked out to 10,000 cubic feet. Some portion of this was for slot cookers. He had not his specification of the plumbing work with him, but ¼-inch pipe would only be allowed for one light, ⅜-inch for three lights, and so on. With regard to insurance, he found that he could insure cheaper than Mr. Townsend had stated. Mr. Shadbolt had mentioned 30s.; but he could insure for £1. In the price he had given for the installation, he had not allowed anything for works or main charges. He had prepared a balance-sheet showing the cost of 1000 slot-meter installations, where the works and mains were large enough for a further sale of 10 million cubic feet per annum. The average cost of 1000 houses fitted up

with brackets, pendants, piping, and wages (the fittings including one incandescent burner), was 15s. 1d. This had been referred to as a rather low figure. The cost of the prepayment meter was £1 18s. 6d., of the slot cooker £2 3s. 9d., and of the service-pipe 10s. 6d. The last was considered much too low; but he found that with eight or ten houses in a row, he could take a 1-inch main service across the street, and, having ¾-inch branches each way, it would work very well. All the branches were joined to the main service. The figures he had just given made a total of £5 7s. 10d., and included, as he had said, the slot cooker. But where, instead of a slot cooker, they had a griller, the cost was reduced by £1 18s. 3d.; and this gave a total of £3 9s. 7d. against Mr. Townsend's charge of £3 7s. 7d. Fitting up 1000 houses with breakfast-cooker at £3 9s. 7d. came to £3479 3s. 4d.; 120 houses fitted with a slot cooker, at a cost over the breakfast-cooker of £1 18s. 3d., cost £229 10s.—showing a complete cost of £3708 13s. 4d. Then he took the depreciation in this way: Less depreciation and interest as follows:—

1000	internal fittings at	£0 15s. 1d.	=	£754,	allow	5 years'	life	£150
1000	slot meters	,, £1 18s. 6d.	=	£1925	,,	20 ,,	,,	96
120	slot cookers	,, £2 3s. 9d.	=	£262	,,	15 ,,	,,	17
880	br'kfast cookers	,, £0 5s. 6d.	=	£242	,,	7 ,,	,,	35
1000	services	,, £0 10s. 6d.	=	£525	,,	20 ,,	,,	26
	Interest on £3708, at 4 per cent.							148
								£472
	Profit on expenditure of £3708							736
								£1208

Then as to the income, 1000 houses consuming 10,000 cubic feet of gas per house, 10 million cubic feet; 10 million cubic feet at 3s. 7d. = £1791 13s. 4d. Their ordinary gas was 3s., and they charged 3s. 7d. for the slots; but, though the price of gas had risen from 2s. 9d., they did not alter the slot meters, as it was only a temporary rise. They would drop it again in March, and there would be a difference of 10d. from this. Less net cost of gas delivered, exclusive of interest and sinking fund charges: 10 million cubic feet, at 1s. 3d. = £583 6s. 8d.; £1208 6s. 8d. total income. That was to say, deducting £583 6s. 8d., the cost of the gas delivered, from the total of £1791 13s. 4d., left a balance of £1208 6s. 8d. This table worked out at a profit of 20 per cent. upon the outlay. As to the length of time allowed for repayment, in his case he put it all to a suspense account. In reply to Mr. Elliott, who asked about the responsibility attaching to the inspection of internal fittings, he said that he took no responsibility for that. The certificate he gave ran as follows: "I have examined the pipes and found them of sufficient size and run to my satisfaction." They derived their authority from their Act of Parliament, and not from a bye-law. As to the work being done by the plumbers, he thought they had been too much considered at the meeting. They were only a small part of the community; and he did not see why they should block the sale of gas. Since he had adopted the slot system, he had fitted 2000 houses with it—some of them having been erected thirty years. If it had been left to the plumbers, these houses would never have been fitted up in 1000 years. It was really time that something was done. The plumbers had something else to do; they had all the sanitary work, glazing, &c., and they should not be allowed to prevent them selling their gas in the way they were doing at the present day. Mr. Brearley adopted the plan of using a plumber's shop to advertise certain fittings; and Mr. Kendrick seemed to give the work to one plumber in each district. But he thought this gave that plumber a great pull over the rest in a town, and did the others more harm than he was doing.

Mr. KENDRICK: We change the plumber every year.

Mr. MOTTRAM said that showed there was something in what he had said. It made the chosen man the authorized plumber for the gas company or corporation, and did the others a great deal of harm. Mr. Shadbolt asked if the scheme were worth the liability involved in it. His reply was that the liability would very shortly be fully covered by insurance; and, in his opinion, it was well worth the liability. Mr. Shadbolt also said that the 15s. 1d. was below the average cost of the internal fittings; but this was not according to his experience. He found that a lot of houses had gas-piping in, but no fittings; and this brought down the cost to below 15s. 1d. On the other hand, a great many houses had cost more than the 15s. 1d.

Mr. MEUNIER said Mr. Townsend had not replied to any of his queries. In fact, the discussion, although very valuable, no doubt, as giving the expressions of experience, had not quite fulfilled the object with which he read the paper. He should very much like to have had some of his queries settled, even in the absence of experience. Undoubtedly the differences in the cost of maintenance were due to many of the causes that had been mentioned; and how far one item or the other went was a difficult thing to judge. There was no doubt that the carelessness of lamplighters had something to do with it; the same with heavy traffic and all the other points that had been raised. The curious thing was that, in the same locality and identically the same man's ground, under exactly the same conditions right away for twelve months, the lamps themselves should show such a tremendous variation. If they looked at the plan he had prepared, it would be seen that one lamp in a certain district required 22 mantles in a year; whereas another lamp not very far away, with the same kind of burner and mantle rigged up in the same way, with the same anti-vibrator, had only required six mantles. In the former case, the mantle was never thoroughly destroyed; but it had to be changed because of the carbon. In another case, a lamp showed 12 or 13 mantles; whereas the very next one to it only showed six. These were the matters to which he wished to draw very particular attention. With regard to Mr. Bower's automatic lighting arrangement, if they referred to his table, it would be seen that the charge for maintenance was quite as low as when the lamp was lit by the torch. Another thing to show that the construction of the lamp made a difference was this: He had recently put in some 100 to 110 incandescent lamps, 50 of which had got a slight difference in the ventilation. Although they were of the same pattern in every other respect, instead of being rather fully ventilated at the top like the old ones, they were made up a little more solid; the consequence was that the other day, during a storm, they had 21 lamps blown out. This showed that even a minor point like this made a difference, because if they were going to have their lights blown out, the mantles would break. Mr. Frith asked a question with regard to lighting up with brackets a thoroughfare 150 feet wide. This seemed an unusual width; and the only thing he could recommend him to do was to have his brackets as ornamental as he could, use some self-intensifying lamps, and put them opposite one another on either side of the road, not more than 20 feet apart. If he did this, he thought Mr. Frith would get a very decent light indeed. With reference to Mr. Kendrick's remarks, one point that he had raised required attention; and that was the regulation of the air supply. He did not altogether think that the regulation of the air and gas was as accurate, or, at any rate, as businesslike, as it should be. He noticed that some of the later burners that they were getting from abroad, especially the "Novita" burner, seemed to have a very ample margin—much more ample than one would think necessary for the restriction of the air. The gas supply was kept normal, working without a governor. He had tried it, and found that practically if they had very low pressure they required a very small amount of air to fill the mantle; but one could always fill the mantle, whatever the pressure was, just by the regulation of the air. Mr. Kendrick's experiments showed distinctly the necessity for some method of regulation. It seemed to him that they should lay themselves out to discover what was the most suitable class of burner—the handiest and the cheapest—and pass it on to the consumer and for public lighting.

SUBWAY SYSTEMS.

Extracts from the First Prize Essay in the competition on the above subject instituted by the Paviors' Company, to which reference is made on p. 525. The winner of the first prize of £100 is Mr. R. M. Parkinson, of Peterborough.

There is no doubt that the prevention of the constant opening up of the roadway in our busiest streets is becoming one of the most pressing questions of the day. No sooner has a road been widened and repaved, at great expense to the community, than it is often immediately broken up again for the laying of a new water or gas main, or the repair of an old one, or, perhaps, for the making of a single house-connection. The relief given to the traffic by the widening is often more than nullified by this for a considerable time; and the effect on the finished surface of the roadway is felt for months.

Three courses may be taken in dealing with an evil—it may be remedied, mitigated, or left alone. There are cases where the cure or abatement of the evil would be worse than the evil itself; and as the existing heavy rating of town property is an element in the case, it may be often advisable to adopt the last course, especially where the ground is of a treacherous nature, and where large quantities of water may be encountered, and where adjacent buildings may be injured by the necessary excavation. It is, however, impossible to generalize. Each case can be treated on its own merits, and in the way the special circumstances applying render it best.

Owing to the increased and increasing value of property in cities, our buildings have been doubled in height, while the streets have, with but few exceptions, remained of only one storey. Below the surface, however, really making a second storey, are generally to be found a multitude of water, gas, and hydraulic mains, sewers, rain-water drains, telegraph, telephone, and electric lighting wires, tramway rails, and the like, running in all directions, and often in unknown positions. Bell and electric lighting wires, as well as gas and water pipes, are in a house placed where they can be got at—not under oak block floors laid on concrete; and at first sight it would appear that the same thing should be done in the street. The problem as to how to do it is a difficult one; and no plan can be recommended as being applicable in all instances.

The cases that commonly occur may be grouped under three heads: (1) New, or comparatively new, streets with macadamized roadways and paved footways. (2) Paved streets in which tramways are laid. (3) Very old streets, where the cellars often extend up to, and even beyond, the kerbstone. Other cases there are where railways, large mains, and sewers are to be found, but these must be dealt with on special lines; for it is impossible to consider every combination of circumstance that can occur.

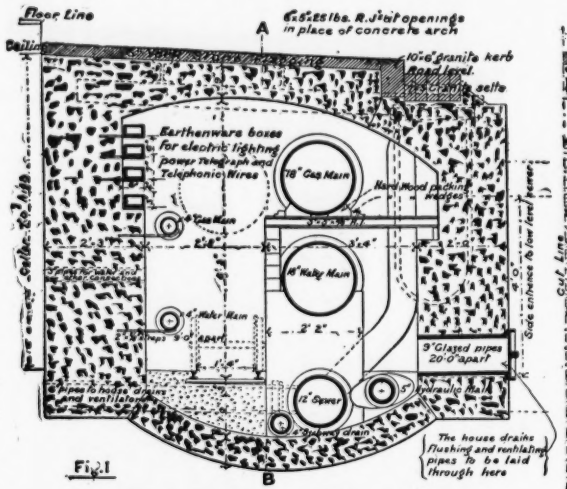

Floor Line
A
B
6"&5"25 lbs. R.S. tail openings in place of concrete arch
10"x6" granite kerb Road level.
Earthenware boxes for electric lighting power telegraph and Telephonic Wires
18" Gas Main
Hard Wood packing wedges
15" Water Main
4" Water Main
2'2"
9" Glazed pipes 20'0" apart
12" Sewer
5" Hydraulic Main
4" Surface drain
Side entrance to low level sewer
The house drains flushing and ventilating pipes to be laid through here

Fig. 1

DEEP SUBWAY UNDER PAVEMENT

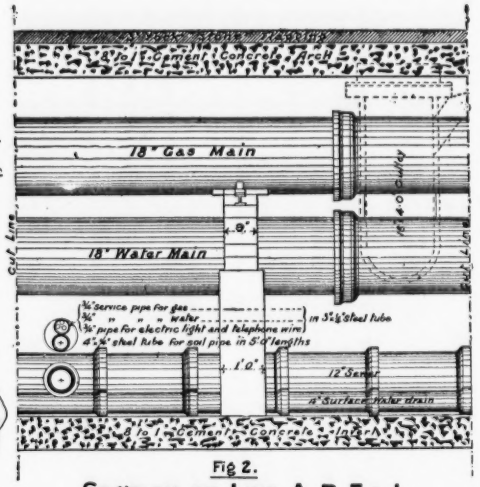


Fig 2.

SECTION ON LINE A.B. FIG. 1.

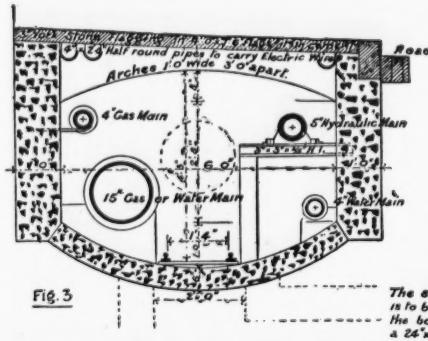


Fig. 3

The side entrance to the sewer is to be diverted and reached from the bottom of the Subway through a 24"x 15" hinged cover.

SHALLOW SUBWAY UNDER PAVEMENT

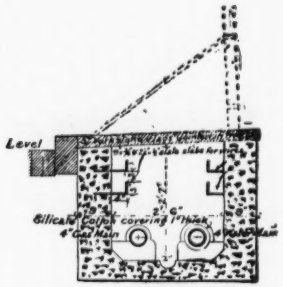


Fig. 4.

SHALLOW SUBWAY UNDER PAVEMENT

NOTE All flushing tanks that come in the way must be rebuilt just outside the new walls and access given by side entrances.

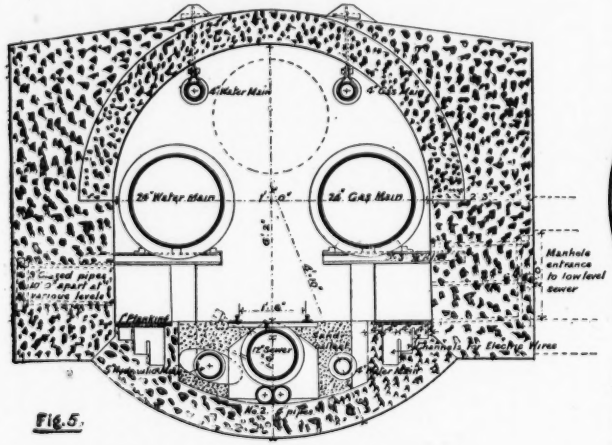


Fig. 5.

SHALLOW SUBWAY IN ROADWAY

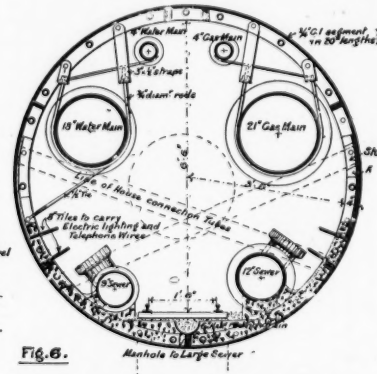


Fig. 6.

DEEP SUBWAY IN ROADWAY

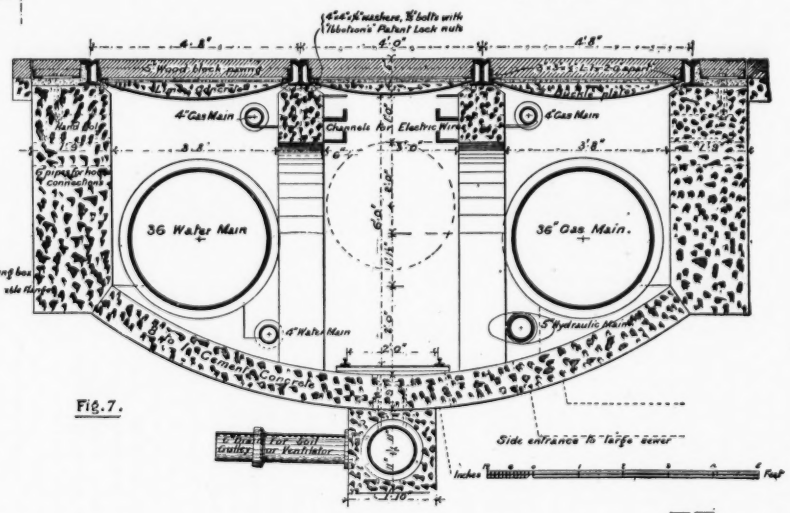


Fig. 7.

SUBWAYS UNDER TRAMWAY

S 4.021

MR. PARKINSON'S SUBWAY SCHEMES FOR NEW STREETS.

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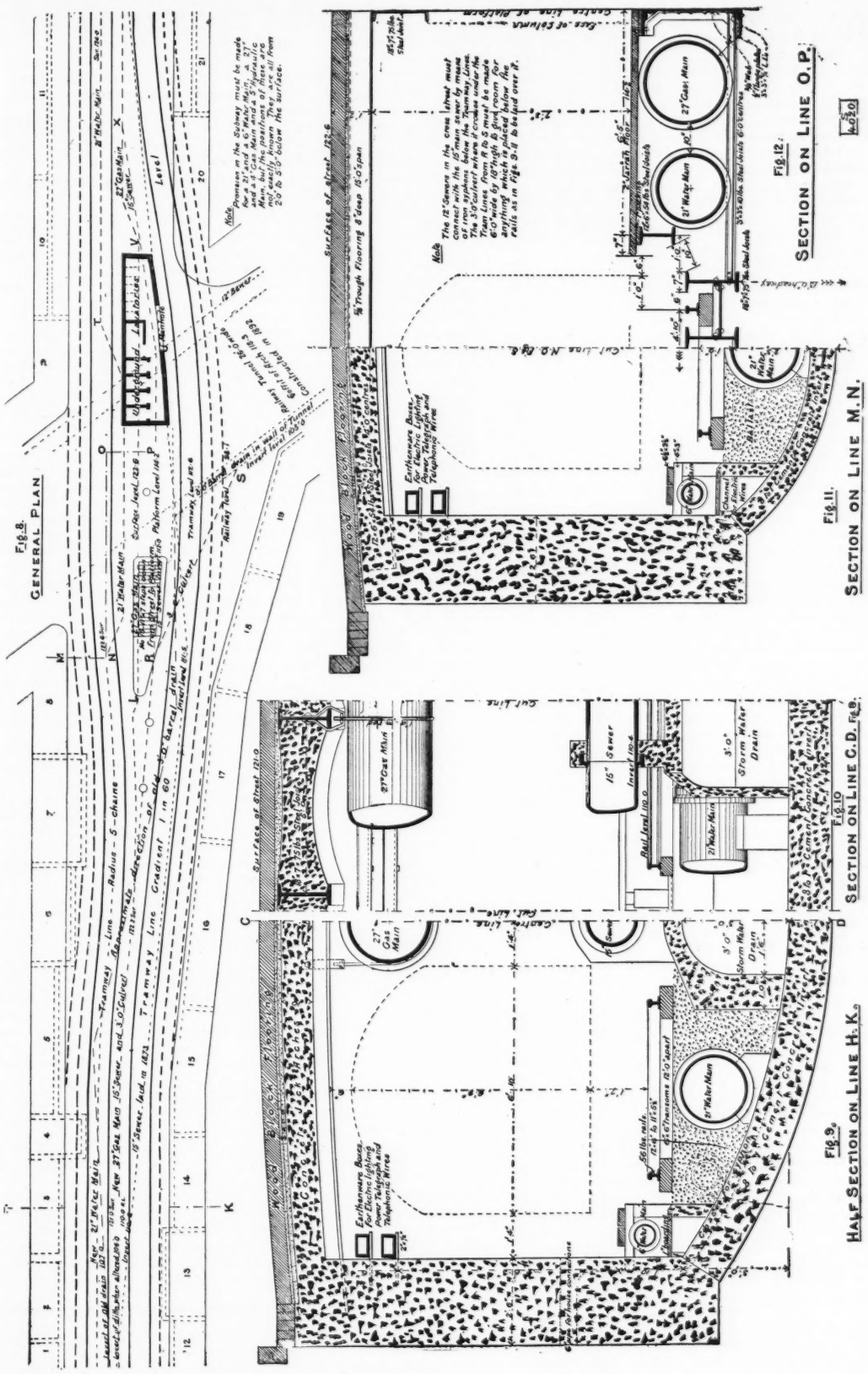

MR. PARKINSON'S SUBWAY SCHEME FOR AN OLD STREET.

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Having prepared the parliamentary plans for a number of the London subways, and having had considerable experience in laying water and gas mains and sewers, and having, moreover, superintended the construction of heavy works in London, both as contractor's agent and as resident engineer, the writer feels that his ideas on this matter should be of some value. He proposes first to take the comparatively simple case of a new street, where, owing to the configuration of the ground, the sewer can be laid at an almost constant depth below the surface, in order to be low enough to drain the cellars, which are assumed not to project under the footway, and then to consider the necessary modifications that must be made in the plan should the sewer be at a considerable depth, or should it be necessary to avoid the footway and place the subway in the roadway, either near the surface or deep down or under a tramway. He then intends to take an imaginary old street, and to deal with it at various points, starting with an ideal section and modifying this to meet certain difficulties at various points. However simple or however complicated the system may be, the first thing to be done in treating any case is the preparing of an accurate plan, to a scale of perhaps 8 ft. to 1 in., to show the positions and levels of all the mains and connections; and the houses and cellars abutting on the

road, as in fig. 8. The first difficulty that occurs is a legal one. It appears to be the law that, in certain, if not in all, cases, half the street belongs to the frontager, and that the public have only a "right of user;" but, on the other hand, it has been held that, where a cellar projects under the roadway, the ground below does not necessarily belong to the owner of the cellar.

In order to settle this question, and to authorize the construction of subways everywhere, a General Act of Parliament is required, and some strong clauses should be inserted as to compensation, giving the arbitrator power to take into consideration the probable improvement in the property in assessing compensation for the taking of a cellar, or part of it, as in the case of the Light Railways Act of 1896. This should be fair, and the community should be protected against exorbitant claims and endless litigation. To this end, the compensation should be fixed by an official arbitrator, and not by a too generously-minded jury.

It is best to avoid touching the cellars; but there are cases where this is impossible, as in Bath, and many streets in London. The writer once came across a cellar in the City which projected, not only right under the street, but even under a house of different ownership opposite. There should be a provision in the Act for providing new cellar accommodation, perhaps at a lower level, to meet such a case as this; otherwise the amount of compensation, really fairly due, might be enormous. It would perhaps be hardly possible or fair to make the gas and water companies, or the frontagers themselves, pay for any very large proportion of the improvement; but a charge should be made calculated on the estimated saving in the repairs in the case of the companies, while the frontagers ought to pay for access to the tramway, which could be utilized for the removal of their ashes and for other purposes.

However constructed, the following requirements must be satisfied in every subway: (1) Sufficient room must be left round the mains to enable the pipe jointers to work. This should be 4 inches for spigot and socket iron pipes, and 2 inches for flanged iron pipes and for stoneware pipes. (2) Sufficient room (10 inches) must be left between the mains to enable the pipe jointers to crawl to the other side, and sufficient head room (3 feet) must be given them to work in. (3) Sufficient room (21 inches by 5 feet) must be left to enable men to walk upright along the subway, although, in certain cases, this rule may be modified. (4) Accommodation for bringing in the largest pipes must be given in the form of a tramway, which ought to run down to a canal or railway. In London every system should, if possible, start from the river, where the material excavated can best be got rid of, and where ballast and cement can be obtained most cheaply. (5) Provision must be made for getting rid of surface water, especially where the soil is water-bearing. (6) Sufficient room must be provided, so far as it is possible to estimate it, for all existing and possible additional mains.

Besides the ordinary sewers and large mains, there are often low-level sewers and service-mains and a multitude of other things to be dealt with. The following will give some idea of what may be found in a street.

Sewers.—For surface water, sewage (high and low level), and their connections to the houses, gullies, and ventilators.
Water-Mains.—Large and small, and their connections to the houses, hydrants, and flushing tanks.
Gas-Mains.—Large and small, and their connections to the houses and street-lamps.
Hydraulic Mains, and their connections.
Electric Lighting and power feeders, telegraph and telephone wires, and their connections to the houses, tramways, &c.
Pneumatic Tubes and air tubes in connection with Shone's ejectors.
Railways and deep subways.
Cellars, lavatories, and street crossings.
Tramways and their bonding wires.

Eight schemes are given herewith. Except in figs. 4 and 7, where the top can be removed, sufficient room is everywhere given for taking in the largest pipe that can be used on a tram-line, as in requirement No. 4. Except in figs. 3 and 4, sufficient head room (6 feet) and width (1 ft. 9 in. except at the joints as in fig. 5) is given for a man to walk upright, to comply with requirement No. 3. A space of 10 inches is given between the pipes for a man to crawl through to work on the other side, and as much room as possible is allowed for him there. Fig. 12 leaves something to be desired in this respect; but under the conditions this is unavoidable.

In certain places the water-pipes must be covered with fine sand, felt, or other composition, in order to keep out the frost; but the temperature in a subway is rarely low enough for this to be necessary. In fig. 5 the water-mains are covered with sand; and in fig. 4 with silicate cotton. The water from the hydraulic mains is generally wasted, and so cannot be mixed with glycerine. So these pipes require the same protection, if any, as the water-pipes. Figs. 1 and 2 are cross and part longitudinal sections, respectively, of a subway under the pavement where the sewer is at a reasonable depth, and relate to Scheme No. 1. Figs. 3 and 4, Scheme No. 2, constitute a cross-section of a street where the sewer is not dealt with. Figs. 5 and 6 are sections of a subway under the roadway; the one, Scheme No. 3, being near the surface, and the other, Scheme No. 4, deep down or in water-bearing strata. Fig. 7, Scheme No. 5, deals with a tramway. Fig. 8 is the plan of an imaginary old street; and figs. 9, 11, and 12, Schemes Nos. 6, 7, and 8, are cross-sections of this at various places—Fig. 10 being a part longitudinal section of fig. 9.

It is necessary to make the stability of the side walls independent of any support they may get from the earth behind them, as the ground may at any time be excavated for cellars; otherwise an arched roof might be substituted for the girders in figs. 9 and 10 where sufficient depth could be obtained. More pipes are shown than are ordinarily met with; but they are so shown in order to illustrate the maximum capacity of the subway.

[Mr. Parkinson here describes the eight schemes in detail; but the drawings sufficiently convey his proposals.]

The walls have been shown as of concrete, because, owing to cheapness of ballast and cement in London, this is the best material to use there; but brickwork, with brindle facing in damp situations, would be better in many places.

The side walls should be first put in—trenches of their exact width being excavated and filled in with concrete; and no attempt should be made to give a smooth face. Trenches should then be cut across the road for setting the girders; and these latter should be covered over with packing-blocks 9 inches deep, on which two thicknesses of 4-inch planks should be laid, the planks in the second layer to take the traffic being parallel to the girders. The 9-inch packing-blocks are provided to enable the planking to be laid quite clear of the road metal, which can be removed from between the girders to put in the concrete arches without trouble.

After the girders and temporary flooring boards have been fixed, the ground below may be removed for a depth of 6 ft. or 7 ft., at which level 12 by 12 timbers should be put across from wall to wall 12 feet apart, to keep all secure till the invert has been put in. The concrete arches can be constructed from below without removing the temporary flooring; but it is necessary to close half the street for the laying of the flooring blocks.

It would be simpler to refill the road metal over the girders along one side of the street and close the other, form the concrete arch on the earth as a centre, and then do the paving and reopen; but some time must be allowed for the concrete to set, and so the street would be blocked up for a much longer period than is required for laying the paving alone. Also as the work would have to be done from the top, the streets would be more blocked by the extra traffic, whereas, if done from below, the earth could be taken right away, and the concrete materials brought up from the tunnel.

The old pipes would have to be slung or strutted up until they could be diverted. For the first length undertaken new pipes would have to be provided, and the old ones utilized for the second length, and so on; temporary connections being made where necessary. Should any old pipes come within 2 ft. of the surface, the girders must be packed up over them temporarily, and afterwards lowered down to their right level; and if they come even higher, 12 by 12 timbers must be used in place of the girders temporarily. During construction, the subway will be so full of old and new pipes running in every direction that only small 2-feet gauge waggons will be able to be used. These can, however, tip into large waggons in the finished part of the subway; the permanent tramway being laid for this purpose as soon as possible.

The writer—having fully described the eight schemes, and given a careful estimate of the cost of each—says it is natural that his views as to which is the best of these should form the ending of the paper. Further consideration has, however, only confirmed the views expressed in the preface—viz., that no general rules can be given. It is true that, all else being equal, Scheme No. 3, fig. 5, gives a better result for the money than Schemes Nos. 1 and 4, figs. 1 and 6, and that Scheme No. 2, figs. 3 and 4, is, on the same premises, the best system if the sewers are not to be dealt with.

Schemes Nos. 6, 7, and 8, figs. 8 to 12, cannot be compared with the rest as to cost; No. 7, fig. 11, providing far more for money than any of the others—the slight inconvenience caused by the up and down tram-lines being put in different streets being compensated for by the saving in expense. A celebrated artist once explained that his success as a painter arose from his following the rule: "First know what you want to do, and then do it." So here, before anything can be done, it is necessary for careful plans to be made to show what is wanted.

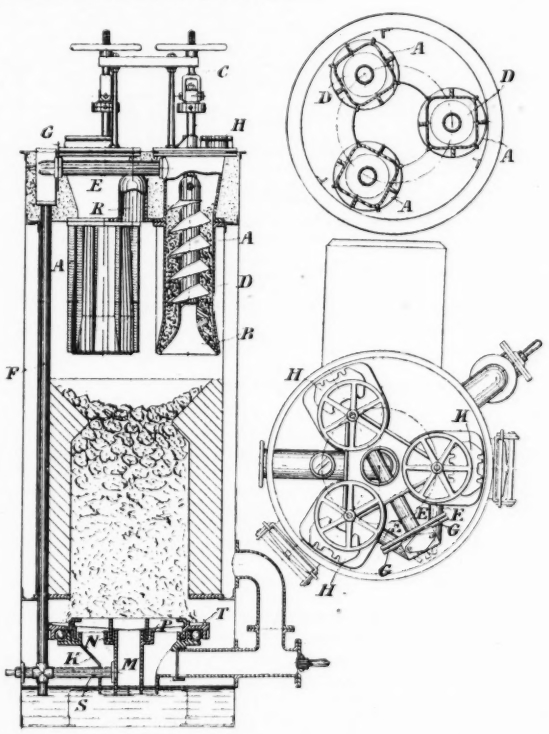
The Paris Electrical Retort Charger and Ram.—The Chairman and Directors of the Sutton, Southcoates, and Drypool Gas Company, accompanied by Mr. J. Holliday, their Engineer, recently paid a visit to La Villette Gas-Works of the Paris Gas Company, where they were shown the electric machines for charging and discharging retorts, which are at work in one of the large retort-houses, and of which they made a careful and critical inspection. On their return to England, Mr. Holliday drew up his report on the subject; and, acting on his advice, the Directors have placed an order with the Electric Turbine Company, Limited, for a complete installation of the Paris machines—including also the necessary coal-hoppers, coal-conveyors, hot-coke conveyors, &c., all driven electrically. The Whessoe Foundry Company, Limited, of Darlington, the sole manufacturers of the plant in England, have the work in hand for completion by May next.

REGISTER OF PATENTS.

Production of Gas from Bituminous Coal.—Crossley, W. J., and Rigby, T., of Openshaw, Manchester. No. 24,194; Nov. 5, 1902.

Explanatory of their proposal, the patentees remark that when fuel is gasified in producers, such as are commonly used to supply gas for engines and for heating purposes, the tarry vapours given off from the upper portion of the fuel pass away with the incondensible gas generated in the hotter lower portion of the fuel. When the gases are cooled, the vapours condense; they are carried forward in a state of suspension in the other gases, and are difficult to remove; also a more or less appreciable proportion of the combustible matter originally available in the fuel is wasted. Some fuels cake into a compact mass when the volatile matter is being distilled from them, and are not suitable for use in producers as commonly constructed. The present invention therefore has for its object "the production of gas free from troublesome impurities, and to enable any kind of fuel, whether caking or not, to be used satisfactorily."

In gas-producers as usually constructed, the fuel is generally fed into the top of the producer, directly on to the bed of fuel contained therein, or into a bell or receiver device, arranged with the object of keeping a reserve of fuel and a constant working fuel depth. But in the present invention, fuel is fed in the first place into a closed retort or retorts, heated by any means desirable. The resultant volatile gases and vapours are taken away by any suitable means and passed into the lower portion of the fuel bed of the producer, together with steam or air, or both. Other suitable available gases—such as those containing a proportion of carbon dioxide or carbon monoxide—may also be passed into the producer with the volatile gases from the retorts. Any tarry vapours which may be present in the mixed gases and vapours are broken up during their passage through the heated fuel; leaving the upper portion of the producer as permanent gases, and enriching the other gases produced.



The engraving shows an arrangement of producer in which the fuel is distilled in the retorts A by the sensible heat of the gases and the radiant heat of the fuel; the caked residue being afterwards fed into the producer and consumed there. The retorts are arranged with hollow spiral castings B, which close the retort on the bottom end. The screw tackle C is arranged so that the casting may be rotated independently of the screw and tackle; the spindle being free to rotate in its socket. When the spindle is turned by the capstan, any fuel lying in the spiral of the castings will be either projected upwards or downwards, according to which direction the capstan is turned. When charging a retort, the valve face of the casting B is tightened in its place; and the fuel admitted into the retort is projected downwards into the spaces between the spirals by turning the capstan in the proper direction. When discharging a retort, the casting B in the first place is lowered a distance by means of the screw, and the capstan is then turned in the same direction to that when charging. The coked fuel is thus projected downwards and broken up by the spirals.

The volatile matter leaving the retorts in gaseous form is conducted by way of the pipes E F to the lower portion of the fuel bed of the producer, and passed into it with or without an added quantity of gases or vapours, as already described.

When a charge has been completelydistilled in a retort, the gas outlet is shut off temporarily by means of the dampers G. The coke or residue is then broken up into suitable sections by the spiral and dropped out of the retort into the producer. A fresh charge is fed into the retort through the door H, which is then secured, and the damper G again opened.

A convenient method of taking the volatile gas from the retorts to the lower portion of the producer is by aspiration. This is preferably done by means of a centrifugal exhausting fan or positive exhauster arranged on the gas outlet side of the producer—delivering the gas at a desired pressure into the gas delivery main. This is done in the arrangement shown. The retorts being connected by pipes to the lower part of the producer, the aspiration is felt not only in the air pipe leading to the fire-grate, but also in the retorts and the pipes leading to them. The fire-grate T is of the rotary type, and is carried by a ring K, the lower portion of which is immersed in the water contained in the lute of the producer. In addition, a second ring M is arranged concentrically inside the other, and is also immersed in the water. The upper portion of the inner ring is arranged with an annular groove N, which contains sand or water. On the underside of the fire-bars is arranged the vertical ring P, which is immersed in the sand or water. Connection is made to the inner ring by the pipe S passing through the outer chamber. The gas made in the producer is passed upwards in contact with the walls of the retorts, and, leaving the producer by the outlet pipe R, passes on for further treatment as desired.

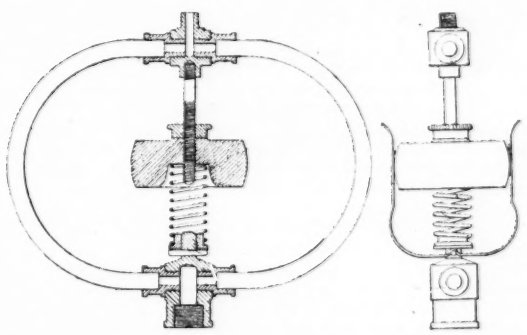
Preventing the Breaking of Incandescent Mantles.—Sutton, C. J., of Bolton, and Rudd, J., of Atherton. No. 25,253; Nov. 18, 1902.

The patentees propose to use a ferrule made to fit over the portion of the burner where the mantle or hood overlaps it. The ferrule is made of aluminium or other material that does not oxydize, or the materials are treated so as to render the surface in contact with the mantle impervious to oxidization, by enamelling the ferrules with porcelain or other suitable materials. By this means, the mantle does not, it is said, bind to the burner as it does to an oxidized surface; and it is free to contract without the resistance offered by an oxydized surface. The life of the mantle is thus said to be considerably prolonged.

Anti-Vibrating Supports for Incandescent Burners.—Keith, J. & G., of Farringdon Avenue, E.C. No. 27,573; Dec. 15, 1902.

This anti-vibrating support for incandescent burners is designed to be used more especially in cases in which the burners, instead of being suspended, are supported from below.

It is composed of a flexible metallic tube (preferably of the seamless corrugated type) bent to approximately the form of a circular hoop and attached to the gas-supply pipe or bracket at the lower side; while at the upper side it is attached to a fitting carrying the incandescent burner, to which the gas supply is led through the flexible tube.



To prevent undue oscillation of the burner body, there is a brake, composed of a weight depending from the burner body, against the sides of which the prongs of a spring frame bear. The frame is so centred on the fitting or tubing that it is free to oscillate on a spring-washer or universal joint,

The invention is illustrated in sectional side elevation (one modification of the anti-vibrating support in which the anti-vibrator tubing is in the form of a circular hoop) and end elevation, with the flexible metallic tubing omitted to better show the brake.

Gas-Producers.—Hislop, G. R., of Paisley. No. 28,877; Dec. 31, 1902.

This invention has for its object "to improve the construction of gas-producers, in order to better adapt them for the gasification of coal and slack and for continuous working."

Fig. 1 (p. 552) is a vertical section, fig. 2 a front elevation showing one construction of a single producer. Fig. 3 is a longitudinal vertical section, and fig. 4 a plan of the same. Fig. 5 is a vertical section showing two producers forming part of a battery.

The producer comprises a chamber A of ordinary form, but having on each side (or centrally as well as on each side) inclined or curved grate-bars or gratings B, resting on bearing brackets C, through which air and steam are directed into the fuel, and a hearth or plate D to support the fuel. As shown in fig. 1, this may be a movable or swivelling plate, which, when in a horizontal position, forms a practically solid hearth plate, but when turned up vertically on edge as shown, or rotated, serves to break up and loosen the ash and burnt fuel at the lower part of the producer chamber.

The usual water and ash pans E are provided under the inclined grate-bars or gratings, or a water base of any form may be provided; and under each of the grate-bars horizontal beams F extend throughout the length of the producer, and serve not only to support the gratings, but also seal the space under the swivelling base plate, so as to exclude any ingress of air there when blowers are employed.

The swivelling plate, which occupies the central space between the inclined grate-bars, is fixed upon a shaft carried through a central boss and passing through the front of the producer, where it is provided with

means for its rotation, in order (by rocking or turning the plate) to facilitate the descent of the ashes through the central space between the grate-bars into the water-trough G beneath, when so desired. The plate may, however, be locked or fixed in a horizontal position, and so provide a solid hearth for the producer when required. It may be perforated, or (as preferred) its sides toothed or serrated, to provide the desired openings for the admission of air and to adapt them for acting on the ash and burnt fuel when swivelled or rocked.

Fig. 1.

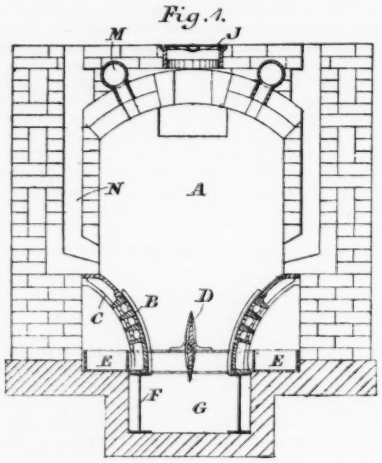
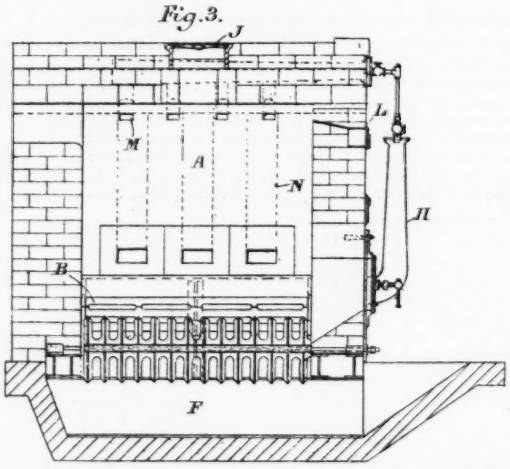


Fig. 3.



When a large quantity of coal or coke has to be gasified, a series of producers may be built alongside each other in batteries, as indicated in fig. 5; and the capacity of the individual producer chambers may be increased by combining two or more producers, by removing one of the side walls or a partition wall ordinarily separating two producers (such as the division wall A^1 in fig. 5), to double the width of the producer chamber A, and uniting at the apex the inclined or curved grate-bars or gratings B, which would in the smaller producers rest against the partition wall. The division wall being thus removed, a

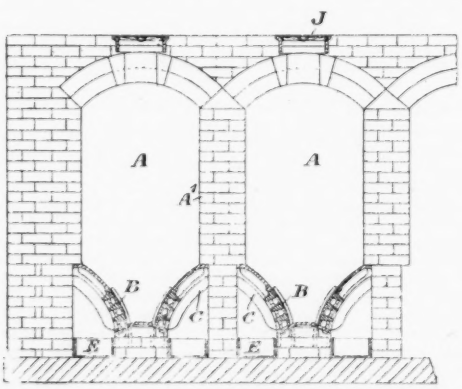


Fig. 5.

producer of extra width is obtained, in which a central double inclined grating is naturally produced in the form of a bee-hive cone or pyramid, in addition to the inclined gratings or bars at the side walls remaining. In such an enlarged chamber, two hearths or swivelling plates would be provided—one on each side of the central conical grate-bars. Air and steam are led or forced by suitable blowers H through the central grate-bars, as well as through the bars adjoining the side walls of the producer chamber, and the ashes are directed through the two spaces between the gratings into the trough G below, or withdrawn through doorways I in front.

The producers are built of brickwork with arched roofs, provided with fuel charging hoppers J and with outlet pipes or openings K. In each case they may be encased in iron or steel plates, in which, or in castings built into the brickwork in front, a series of openings fitted with plugs L are provided, for the purpose of inserting bars for stirring up the contents of the producer.

Fig. 2.

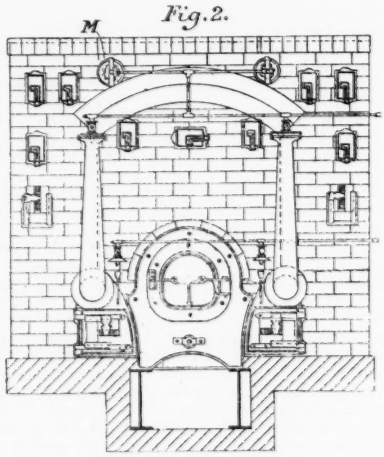
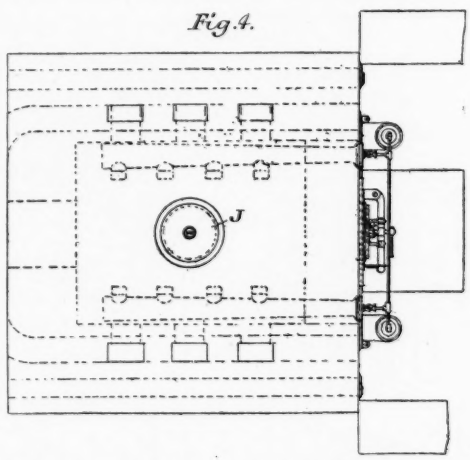


Fig. 4.



The producer may also be constructed with ducts or passages M for leading in air, or air and steam, at the crown of the chamber, and with like ducts or passages N for the outflow of gases near the bottom during the period while the coal being gasified is yielding up its volatile matters. The outlet of the gases from the producer may thereafter be reversed by the use of dampers or valves connected to the ducts or passages.

Controlling the Pressure in Gas-Mains.—Nielsen, C., of Copenhagen. No. 28,156; Dec. 20, 1902.

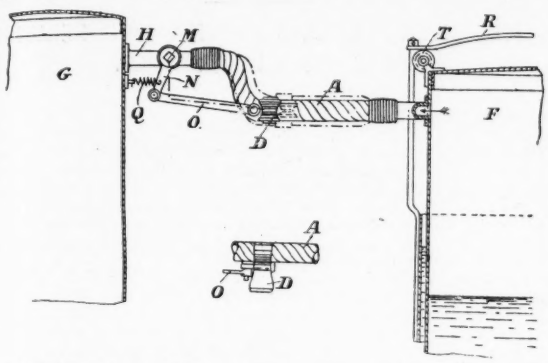
The inventor proposes to automatically control the pressure of fluid supplied to (say) a gas-main by the application of a piece of hose capable of expanding either in its cross sectional or in its length direction, or which is otherwise capable of altering in shape as soon as a certain predetermined pressure of the fluid conveyed through it to the gas main or other vessel has been reached and exceeded. This piece of hose is provided with a connecting device to a cock or valve whereby the fluid pressure to the main is controlled, while the pressure at which the controlling device is to commence its action can be altered.

The illustration (p. 553) shows the use of the hose in a gas conduit or pipe for manipulating a safety or regulating valve. The hose A is inserted between the gas-reservoir G and the gasholder F, from which latter the gas is conveyed to the various mains. A valve or cock M is provided upon the pipe H connected with the hose and with the gas-reservoir. The valve is opened or closed by a link O, one end of which is connected to the clamp D on the hose, and the other end to the lever N on the plug of the cock. Q is a retractile spring, which at one end is fastened to the reservoir G and at the other end to the lever N. The spring serves to close the cock. The clamp D is adjustably mounted on the hose, as shown in the detail engraving.

As soon as the maximum volume is attained in the gasholder F, the roller T on the bell strikes the cross-bar or other stop R, and the increased pressure acts upon the interior walls of the hose A so as to expand it and shorten it, whereby the link O and lever N turns the plug of the cock M so as to wholly or partially open it. The gas superfluously produced can freely enter through the opened cock into the reservoir G until the degree of pressure in the holder is lowered or normal.

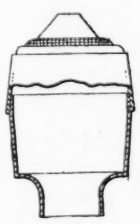
As the gasholder bell sinks, by reason of the gas passing into the mains, the pressure is lowered until the hose lengthens or again assumes its normal form (shown in full lines), so that the spring Q will influence the lever N and link O in such a manner as to again close the valve M.

If the degree of pressure is again repeated, the specified action will be repeated.



If all the pipes leading up to the burners in the street-lamps are fitted with pieces of hose D, the lights may all be automatically lowered or put out simultaneously at any desired time.

Incandescent Gas-Burners.—Alexander, C. J., of Finsbury, E.C. No. 15,397; July 11, 1903.



The patentee proposes to form the head or top of the burner (as shown) of a conical shape, instead of the usual cylindrical shape; the upper part tapering towards the top, so that mantles of different diameters can be fitted to the one burner, while the lower part of the head tapers towards the bottom. The head thus presents somewhat the shape of a barrel. This barrel shape, it is said, affords (for the same size of mantle) a much larger space than the cylindrical head for the mixing of the gas and air, and also results in "obtaining increased pressure in the head, and, consequently, a more brilliant light."

Internal Combustion Engines.—Crossley, W. J., of Manchester, and Webb, W. le P., of Marples. No. 388; Jan. 7, 1903.

This invention relates mainly to internal combustion engines using hydrocarbon liquid as fuel; the claim being for the combination of a special method of governing by which the exhaust and admission valves are kept closed when non-working strokes are required, so as to retain the products of combustion. There is also a special type of vaporizer, which is in open communication, by means of a restricted passage, with the cylinder; the hydrocarbon liquid being introduced to the vaporizer only, and the air being admitted to the cylinder only.

APPLICATIONS FOR LETTERS PATENT.

24,616.—Milbert, P., and Lucas, W., "Automatic gas lighting and extinguishing apparatus." Nov. 12.
24,619.—Schwab, M., and H. Greene and Sons, Ltd., "Manufacture of vitriol." Nov. 12.
24,643.—Grieve, G. K., and Peebles, W. C., "Gas-governors." Nov. 13.
24,648.—Pinfold, J. J., "Anti-vibrator." Nov. 13.
24,667.—Lea, J. W., and Perrins, J. H., "Reflectors for gas-lamps." Nov. 13.
24,726.—Heslop, J. J. S., "Atmospheric burners." Nov. 13.
24,731.—Temple, G. T., and Dixon, H. T., "Mantle holders." Nov. 13.
24,745.—Tresenreuter, G., "Incandescent gas lighting." Nov. 13.
24,756.—Waddell, A. & F., "Receiving coke from retorts, and quenching and delivering same." Nov. 14.
24,779.—Kunwald, M. de, "Manufacture of acetylene." Nov. 14.
24,815.—Maisch, G. H., "Incandescent mantles." Nov. 14.
24,844-5.—Blair, D. R., and Kirby, C., "Gas-irons." Nov. 16.
24,935.—Schmidt, P., "Production of water gas and producer gas." Nov. 16.
24,938.—Lucas, A. W., "Incandescent gas-lamps." Nov. 16.
24,957.—Denny, T. J., and Allen, H., "Gas-producers." Nov. 17.
24,962.—Spreadbury, W. M., "Chimney for incandescent burners." Nov. 17.
24,995.—Little, A. J. S. B., "Inclined retort beds." Nov. 17.
25,068.—West, C. B., "Supports for gas-lamps." Nov. 17.
25,070.—Kyle, A. W., and Dunstone, J., "Suspending incandescent gas-burners." Nov. 17.
25,092.—Dickson, J., "Supporting incandescent lights." Nov. 18.
25,104.—Jamieson, W., "Producer gas." Nov. 18.
25,115.—Davies, O., and Thomas, D., "Gas-producers." Nov. 18.
25,120.—Howorth, F. W., "Gas turbine wheels." A communication from the Aktiebolaget Multipelturbin. Nov. 18.
25,165.—Nesfield, V. B., "Detecting gas." Nov. 18.
25,270.—Adam, W. W., "Incandescent burners." Nov. 19.
25,339.—Beal, W., "Incandescent gas-fittings." Nov. 20.
25,353.—Tomlin, R., "Incandescent burners." Nov. 20.
25,384.—Welch, W. H. I., "Regenerative lamps." Nov. 20.
25,398.—Rutty, W. J., "Anti-vibrator." Nov. 21.
25,405.—Hamilton, J. H., "Gas-driven blowing engines." Nov. 21.
25,426.—Lowen, W., "Incandescent burners." Nov. 21.
25,458.—Theisen, E., "Gas-purifiers." Nov. 21.
25,467.—Müller, R., "Gas-burners." Nov. 21.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Advantages of Profit-Sharing and Co-Partnership.

Sir,—*Apropos* of the correspondence which has recently appeared in the "Journal" on the above subject, it is interesting to notice that the recent conflicts between Capital and Labour in the United States are forcing the enlightened men there—our friends in the gas industry among the number—to seek for a remedy. I have recently received an application from one of the foremost American Gas Engineers for particulars of the co-partnership system adopted by this Company; and it occurs to me that the facts I have given to him may be interesting to your readers. The following is an extract from my letter:—

The co-partnership system, devised by Sir George Livesey and fully described by him in a paper he read at the Co-Partnership Conference of the Labour Association at Newcastle-on-Tyne in 1899, of which I send you a copy, was introduced by him to this Company in 1894, less than ten years ago. Since then, the men have received as bonus the sum of £16,629. Of this, they have invested in the stock of the Company the sum of £14,130. Beyond and above this, they have deposited with the Company, at interest, savings to the extent of £3428; so that their total holding in the Company at present amounts to £17,558, or an average of over £35 per man. This splendid result, I venture to think, is abundant proof of the material benefits the system confers upon the men; for I am quite sure that but for its adoption, they would not be possessors of as many pence as they now own pounds. The moral effect upon the men has been as great—nay, greater. They have realized that profit-sharing involved profit-earning, and that their interests and those of the Company are identical. This has led them not only to do their own work with greater zeal and pleasure, but to make many valuable suggestions with the view of promoting economy of working and the general efficiency of the Company. This shows they have merged their individuality in that of the Company, and are no longer a collection of units. each careful only for his own interest and indifferent to the rest, but that they recognize their responsibility to work for the general good of all concerned. They promptly report to the foreman any man among the new hands who may show a disposition to take things easily, at their and the Company's expense; so that idle and careless men must quickly alter their methods or find other employment.

The practice of thrift, so long and so earnestly urged upon them by Sir George, is bearing good fruit; not only as shown by the £3428 they have voluntarily deposited with the Company, in addition to the bonus they have invested, but in increased sobriety, steadiness, and self-respect. By becoming holders of property to, for them, a considerable amount, their character and conduct have changed entirely for the good. Having more self-respect, they are more willing to respect those whom they serve, and willingly render a hearty and cheerful obedience to the orders of the foremen. A more sober, industrious, or polite body of men than we now have is not, I am sure, to be found in any gas-works. This has not always been so; for, prior to the introduction of profit-sharing, and for some little time after, it is notorious that a very different state of things prevailed. The change is most remarkable, and is, I am sure, mainly, if not entirely, due to the good influence of the co-partnership system.

Lest it might be thought that, in order to provide the handsome bonus for the men, the shareholders of the Company have suffered by a reduction of dividend, or the consumers by a high charge for gas, let me say that in the period in question the former have received the maximum dividends allowable, and the reserve and insurance funds have been increased by about £6100. At the same time, the gas consumers have saved by reduction in the price of gas about £64,000. It might also be thought that the bonus had been provided for by reducing the rate of wages of the men. So far from this being the case, the exact reverse is the fact; for, without asking, a few years ago the Directors made a considerable advance in the rates of wages, and the men have benefited in this way to the extent of £12,500, and they now receive as high wages as any men of their class in the country.

It is clear, from our experience, that the co-partnership system can be entirely self-supporting, and beneficial to all parties. Under these circumstances, can you wonder that the men are happy and contented, and the Company prosperous and progressing? An experience in the management of large bodies of workmen extending over thirty years, convinces me that in the co-partnership system, carefully, wisely, and sympathetically administered, there is one of the best solutions, if not the only solution, of the difficulties which so often divide Capital and Labour with such disastrous results to those immediately concerned and to the community. There may be other remedies equally good; but I have not heard of them. This one I know, and have proved to be effectual; and I heartily commend it to you.

It will be well to caution those who may adopt the system that it will not work successfully without intelligent and careful supervision, especially in its infancy. At first it cannot run alone, but needs the watchful care and kindly interest of those who desire its welfare. After a few years, it will take care of itself; or, rather, those who benefit by it will take care of it.

The bonus must not be given indiscriminately to the industrious and painstaking men and to the careless and idle men alike. Those who are not willing to exert themselves to increase the profits, and show no interest in the system, must not be allowed to share the benefits with those who do. To permit them to do so is to discourage the latter, and cause the failure of the scheme. We find that depriving careless men from participation in the bonus by withholding their agreement until they amend, has a salutary effect upon them and upon the others, and rarely fails to effect the desired improvement.

In view of the great success which has followed the introduction of this system, wherever it has had a fair trial, it is extraordinary that so few companies have adopted it, or taken any similar means for improving the lot of their employees and benefiting their shareholders. Are the Boards of Directors, who naturally must be the initiators in a change of this kind, so enervated by the ease with which they have been able to dispense maximum dividends as to be unable to realize that they have responsibilities to their employees beyond paying them their wages? Surely the happiness and the prosperity of the large numbers of men who are contributing to the success of their undertakings should give them some concern, should enlist their sympathy. When there is a system in use which not only benefits the employees but the employers also, which is a sure prevention of labour troubles of all kinds, which has been tried for years on a huge scale, and proved, beyond question, to be beneficial to all concerned, it is a serious reflection upon the wisdom of those directing gas and other similar

companies, that more of them have not adopted it or something upon similar lines. I sincerely hope the results I have given may have the effect of awaking the attention of those who have the power to extend the adoption of this most beneficent system.

Crystal Palace District Gas-Works,
Nov. 26, 1903. SYDNEY Y. SHOUBRIDGE.

Dr. Thorpe's Tests of Gas and Oil Stoves.

SIR,—In your issue of Nov. 24, you publish, under the heading "Combustion Products of Gas and Oil Stoves," comments by Dr. Thorpe, the Chief Chemist to the Government Laboratory, on the tests recently conducted by his Department. These tests were made with a view to ascertaining the presence of deleterious compounds in the products of combustion given off by flueless gas and oil stoves, and with the special object of determining their suitability or otherwise for use in factories and workshops. That the matter has aroused considerable interest is evidenced by the amount of correspondence we have received on the subject from various quarters. We therefore think it desirable to call attention to a point in your report which may be confusing to many who read it attentively.

In the tabulated results of the tests of gas-stoves, the results shown by A and C are equally satisfactory, while stove B shows a heavy percentage of carbon monoxide. The context, however, implies that the result obtained with stove C is inferior to that obtained with both A and B. This is contradictory; and we have the authority of Dr. Thorpe for stating that in the context the letters were unfortunately incorrectly employed, and that the paragraph commencing "In the case of stove C" should read "In the case of stove B."

In the paragraph following the tabulated tests of oil-stoves also a similar mistake occurs; and the letters B and C should be interchanged. As the stove C is the one which has been so largely recommended by the London and other large gas companies, it is important that this correction should be made.

While, of course, a flue is never a disadvantage, it is satisfactory to have it demonstrated by so eminent an authority as Dr. Thorpe that, while all flueless stoves give off impurities, the most dangerous product—carbon monoxide—is usually present in such small proportion that, with proper ventilation, it could not reach the percentage which has been found to cause mischief.

JOHN WRIGHT AND EAGLE RANGE, LIMITED,
Nov. 27, 1903. per G. E. Wright, Managing Director.

Mr. J. H. Hill, of York, also points to the mistake in the results of experiments carried out by Dr. T. E. Thorpe with gas and oil stoves, which were reproduced in last week's issue of the "JOURNAL" from the annual report of the Chief Inspector of Factories and Workshops for 1902. The stove referred to under the second table in the first column of p. 476 should clearly be stove B—not stove C, as given in the original. Mr. Hill also mentions that the concluding paragraph of the report under the table at the top of the second column on the same page should read: "It will be seen that these quantities of carbon monoxide for the hour's burning are appreciably greater than those yielded by the gas-stoves A and C on the one hand, but less than that produced by the B radiator on the other."

Otley Water Supply.—The Otley Urban District Council have decided to apply to the Local Government Board for leave to borrow £40,000 to complete their water-works. The increased outlay is largely due to the additional cost which the Council have been put to on account of the extra depth of the main trench. The estimated cost of this work in July was £10,000; the extra estimate now is £13,594. The original borrowing powers were for £55,000; but it was assumed that the extra depth and other expenses would bring up the total to £95,726—a difference of £40,726. This includes 10 per cent. for contingencies which figured in the original contract.

How Strikes Assist Foreign Imports.—The following paragraph appeared in "The Times" on Thursday from a correspondent: "It is estimated that the Penrhyn Quarry strike, which has ended after lasting three years, although all the men were not out during that period, cost the district the sum of £364,000 in wages alone. An alarming fact has come to light in connection with the dispute. Before the strike, which began in October, 1900, the amount of slates imported into this country might almost be regarded as a negligible quantity. For the quarter ended March, 1901, the quantity of slates imported amounted to 15,702 tons; and for the quarter ended Sept. 30 the figures reached a total of 31,581 tons. The figures show a steady and alarming increase; and it is feared that the slate trade of North Wales has been permanently injured by the strike."

Sanitation in Bakehouses.—Mr. F. C. Finch, the Secretary of the London Master Bakers' Protection Society, has given notice to the members of the trade that, with regard to correspondence that has taken place, on behalf of the Joint Parliamentary Committee of the National Association, the Scottish Association, and the London Master Bakers' Protection Society, with the Home Secretary, the latter had received a recommendation from the Incorporated Society of Medical Officers of Health that he should make an order, under section 3 of the Factory and Workshop Act, 1901, increasing the standard of cubic space for workers in bakehouses of all classes from 250 cubic feet to a minimum of 500 cubic feet. The Home Secretary has come to the conclusion that a case is made out for an order modifying the present standard so far as regards underground bakehouses and those in which work is carried on at night by artificial light other than electric light; and an order has been drafted accordingly. It specifies that in the latter places, 400 cubic feet of space, instead of 250 cubic feet as at present, shall be allowed for every person employed between the hours of nine in the evening and six the next morning.

PARLIAMENTARY INTELLIGENCE.

NOTICES GIVEN FOR BILLS (SESSION 1904) RELATING TO GAS AND WATER SUPPLY.

Amersham, Beaconsfield, and District Water.—The Amersham, Beaconsfield, and District, Water Company, Limited, intend to apply for authority to extend their limits of supply, so as to include Gerrard's Cross, in Buckinghamshire, and to lay the necessary pipes.

Appleby Corporation Gas.—Authority will be sought by the Corporation of Appleby to purchase the undertaking of the Appleby Gas Company, and supply gas within the borough, with all the powers usually granted to gas companies, including the erection of dwelling-houses for the men employed on the gas-works.

Arlesay Gas.—Application will be made by the Arlesay Gas Company for an extension of their limits of supply, so as to include certain parishes in the counties of Bedford and Hertford. Authority will be sought to acquire the undertaking of the Shefford Gas Company, and use or abandon their works. The usual powers will be applied for, as well as additional capital.

Aylesbury Gas.—The Aylesbury Gas Company intend to apply to be incorporated, and to be authorized to construct and maintain works for the manufacture, storage, and supply of gas. The usual provisions will be contained in the Bill, including one to enable the Company to make application for a Provisional Order or Licence for the supply of electrical energy. The present capital is to be consolidated and increased in nominal amount; and authority to raise more will be sought.

Barnard Castle Gas.—The Barnard Castle Gas Company will apply to be dissolved and re-incorporated, with power to enlarge the existing works and supply gas in Barnard Castle and the neighbourhood. The Bill to be promoted will contain the usual provisions, as well as one to enable the Company to apply for powers to supply electrical energy. The capital of the new Company is to be regulated, and more will be required.

Barnet District Gas and Water.—It is the intention of the Barnet District Gas and Water Company to apply for power to construct additional water-works in the counties of Hertford and Middlesex. They will consist of a well and pumping-station in the parish of Little Berkhampstead, a reservoir at Shenley, and two pipe-lines. Provision will be made for laying mains in roads outside the district, for supplying water within it, for the protection of the pipes generally against electrolytic action, and for the Company obtaining a supply of water from other parties. Further capital will be required.

Barrow-in-Furness Corporation.—In an Improvement Bill to be promoted by the Barrow-in-Furness Corporation, a clause will be inserted to the effect that, notwithstanding the provisions of the Corporation's Act of 1901, they shall be authorized to take water from the River Duddon before the completion of certain works authorized by that Act, at such times and in such quantities as may be sanctioned.

Basingstoke Corporation.—In a General Powers Bill to be promoted by the Basingstoke Corporation, authority will be sought for the construction of water-works in the borough, as well as in the parish of Cliddesden, in the county of Southampton. The works will comprise three wells and pumping-stations, a covered service reservoir, a water-tower and tank, and two aqueducts or pipe-lines. Provision will be made for applying the revenues of the water undertaking and for raising more money.

Belfast and North-East Ireland Electricity and Power Gas.—Authority will be sought for the incorporation of a Company to establish generating stations and supply electrical energy, and construct works and supply gas for power, heating, &c., in the counties of Antrim, Down, Armagh, and Londonderry. The lands indicated for stations are situated in Belfast, Larne, Ballymena, Coleraine, Portadown, and Newry. The usual powers will be required to open streets, lay pipes, wires, &c., purchase electricity supply undertakings by agreement, and levy rates and charges.

Bexhill Water and Gas.—The Bexhill Water and Gas Company will apply for power to extend their limits of supply, so as to include the parishes of Ninfield, Hooe, Catsfield, Wartling, Ashburnham, and Hurstmonceaux, all in the county of Sussex; also to carry out certain works in connection with their water undertaking, comprising wells and pumping-stations, a service reservoir, and several conduits or pipe-lines, in Ninfield and Bexhill. Provision will be made for the sale of water and gas in bulk or otherwise within and beyond the limits; and the Bill will contain regulations in regard to the supply of each commodity. The present funds of the Company are to be applied to the purposes of the Bill; and more money will be asked for.

Bishop's Stortford and District Gas.—Application will be made by the Bishop's Stortford Gas Company to be dissolved and re-incorporated with the usual powers granted to suppliers of gas. The present capital is to be defined, and authority will be sought to increase it.

Blyth and Cowpen Gas.—The Blyth and Cowpen Gas Company will apply for authority to acquire certain lands for the purposes of their undertaking. The existing capital is to be consolidated and converted, and more will be applied for, which it is proposed to issue to the public by auction or tender, or to the consumers and also to the employees of the Company. It is proposed to lower the illuminating power of the gas, and to alter the provisions with regard to testing for purity. Other objects of the Bill will be of the usual kind.

Brixham Gas.—Authority will be sought for the incorporation of a Company to acquire the undertaking of the Brixham Gas and Coke Company, maintain and construct gas-works, and supply gas in Brixham, Churston Ferrers, and Kingswear, in Devonshire, with the usual powers.

Brymbo Water.—Additional capital and increased borrowing powers will be required by the Brymbo Water Company, who wish to extend

their limits of supply, and sell water in the enlarged area, under the usual conditions. Provision will be made for the sale of water by measure, and for its supply to premises used partly for trade.

Cheshire Electricity and Power Gas.—Authority will be sought for the incorporation of a Company to establish generating stations, and supply gas for power, heating, &c., in the county of Cheshire. The Bill to be promoted will provide, among other things, for the acquisition, by agreement, of electricity supply undertakings and the purchase by the Company of current or power gas, plant, fittings, or materials, as well as their sale.

Chesterfield Gas and Water Board.—Power will be sought by the Board to acquire certain lands for a new water reservoir, &c., and for the extension of the gas-works. The reservoir will be situate in the parish of Brampton, in Derbyshire, and in connection with it will be filter-beds and five pipe-lines. The land required for the gas-works extension is situate in the parish of Chesterfield. Authority will be applied for to impound water, to alter the illuminating power of the gas, and to vary or amend the existing right of the Board to make charges therefor. Additional capital will be required.

Chippenham Gas.—The Chippenham Gas Company, Limited, desire to be dissolved and re-incorporated with additional powers. The existing works are to be maintained and continued, and new ones constructed on lands to be acquired compulsorily or by agreement. The usual powers will be sought for the supply of fittings, &c.; and provision will be made for regulating the price, quality, and pressure of gas supplied by ordinary or other meters. The Company wish to be authorized to make application for a Licence or Provisional Order under the Electric Lighting Acts. Additional capital will be required.

Colney Hatch Gas.—The Colney Hatch Gas Company will apply for power to purchase lands compulsorily and by agreement, and construct works for the manufacture and storage of gas. It is proposed to change the name, and to vary the limits of supply in accordance with a modification of boundaries agreed upon with the Tottenham and Edmonton Gas Company. Authority will be sought to supply stoves, fittings, and other appliances, and to create reserve, renewal, and insurance funds, &c. Additional capital will be required.

Corbridge Gas.—The Corbridge Gas Company, Limited, desire to be dissolved and re-incorporated with power to supply gas within certain specified limits. The capital is to be defined, and authority will be sought to increase it.

Croydon Gas.—The proposals of the Croydon Gas Company in regard to a change of name and other matters for which parliamentary sanction will be sought next session were noticed last week (p. 482).

Crystal Palace District Gas.—The scope of the notice given by the Crystal Palace District Gas Company was indicated last week (p. 482).

Derwent Valley Water Board.—According to a notice given by the Derwent Valley Water Board, Parliament will be asked next session to sanction the construction by them of certain water-works, and deviations from the scheme set forth in the Board's Act of 1899, by the abandonment of a portion of the works therein specified, as well as some authorized to be carried out by the Leicester Corporation under their Act of the same year. Powers are, however, to be sought to enable the Corporation to execute other works described. A number of minor alterations are mentioned. The Board require further borrowing powers; and they will be asked for the Corporations of Derby, Nottingham, Sheffield, and Leicester—the last-named body paying the costs of the Bill.

Doncaster Corporation.—The Corporation of Doncaster will apply for power to extend their gas and water limits, construct additional water-works, consisting of a service reservoir in the parish of Warmsworth and two conduits or pipe lines, and maintain and enlarge their gas-works. The usual provisions incidental to both gas and water supply will be included. More money will be required.

Ebbw Vale Water.—The Urban District Council of Ebbw Vale, in Monmouthshire, intend to apply for authority to construct works in that county and in Brecknockshire. They will comprise a reservoir upon the Ebbw River, and a road diversion in the parish of Rassa. The Bill will contain provisions for preserving the purity of the water and preventing waste, as well as various incidental powers in regard to water supply. More money will be needed.

Felixstowe Gas.—The Felixstowe Gas Company, Limited, will apply to be dissolved and re-incorporated, with power to supply gas within the parishes of Felixstowe, Walton, Trimley St. Mary, and Trimley St. Martin, all in Suffolk. Provision will be made for vesting in the new Company all the undertaking of the one now existing. Power will be sought to maintain and extend the works, acquire additional lands, supply fittings and exercise supervision over them in buildings, adopt a sliding scale of price and dividend, charge differential prices, and make contracts for the supply of gas. More capital will be applied for, and authority will be asked for its issue by auction or tender, or to proprietors, consumers, or employees of the Company.

Filey Improvement.—Application will be made by the Filey Urban District Council for an extension of their gas and water limits to the parish of Muston; and the Bill to be promoted to effect this object, among others relating to the improvement of the town, will contain provisions now usual in connection with the supply of both commodities. Additional borrowing powers will be applied for.

Gaslight and Coke and Other Gas Companies' Acts Amendment.—The London County Council have given notice of their intention to again apply to Parliament to make further provision with respect to the illuminating power, purity, and pressure of the gas supplied by the Gaslight and Coke, Commercial, and South Metropolitan Gas Companies. It is proposed to repeal or amend section 12 of the Gaslight and Coke and other Gas Companies' Acts Amendment Act, 1880, with reference to appeals to the Chief Gas Examiner, and enable him to give decisions in certain cases without hearing the parties, or some of them; also to repeal or amend section 18, and make other provisions with respect to the liability of the Companies to forfeitures under the Acts. Other changes in existing legislation are proposed by the repeal of sections 7 to 12, 25 to 34, 37, 40, and 41 of the Metropolis Gas Act, 1860. The costs and expenses of the Bill are to be regarded as payments for general county purposes.

Gomersal Gas.—The Gomersal Gas Company desire to consolidate their existing capital, and raise more; and the Bill of which they have given notice contains provisions to effect this object, as well as others now usual in connection with the supply of gas, stoves, fittings, &c.

Gosport Water.—The Gosport Water Company intend to apply for power to construct new works, comprising a pumping station and well in the parish of Soberton, another in the parish of Bishop's Waltham, a covered service reservoir in the parish of Shedfield, and four aqueducts or pipe-lines. It is proposed to extend the Company's limits of supply, so as to include Swanmore, Shedfield, Wickham, Crofton, Rowner, and Alverstoke, in the county of Southampton. The existing works at Foxbury are to be abandoned wholly or in part, and the site disposed of; and it is proposed to purchase the undertaking of the Lee-on-the-Solent Water Company, which will in that event be wound up and dissolved. The usual provisions are to be included in the Bill. The present capital will be consolidated and converted, and further money powers will be sought.

Hampden-in-Arden Gas.—Application will be made for the incorporation of a Company to construct and maintain gas-works, and supply gas to Hampton-in-Arden and other parishes in the county of Warwick. The usual capital and other powers will be applied for; and the Bill will make provision for enabling the Company to obtain authority to produce and supply electricity for lighting and other purposes.

Harlow and Sawbridgeworth Gas.—The Harlow and Sawbridgeworth Gas Company, Limited, desire to be dissolved and re-incorporated, with power to supply gas in the parishes of Sawbridgeworth, High Wych (and such parts of the last-named place as are detached), Widford, Hunsdon, Gilston, Gilston detached, and Eastwick, all in Hertfordshire, as well as a number of places in Essex. It is proposed to define and increase the capital, maintain and extend the present works, and manufacture and store gas and residual products. Authority will be sought to deal in stoves, fittings, machinery, and appliances, acquire patent rights, levy rents, rates, and charges, &c.

Harrogate Water.—Power will be sought by the Harrogate Corporation for the construction of a tramroad and other subsidiary work in connection with their water undertaking, and for their abandonment at the end of a term to be defined. More money will be needed.

Huddersfield Corporation Act, 1902, Amendment.—Application is to be made next session for an amendment of section 57 of the Huddersfield Corporation Act, 1902, more especially the proviso exempting the Corporation from liability for more than one penalty for the commission of the same offence, or for the same neglect or default. The Bill to be promoted will set forth that, notwithstanding anything contained in the section named, the provisions of section 32 of the Water Act of 1869 and section 28 of the Act of 1890, imposing upon the Corporation penalties for failure to comply with these Acts with regard to compensation water, shall remain in full force; and further provision will be made, if thought fit, for ensuring such compliance. It is proposed to charge upon the Corporation the costs and expenses of obtaining the passing of the Bill.

Kirkby-in-Ashfield Gas.—Authority will be sought by the Kirkby-in-Ashfield Urban District Council to supply gas within their district and the parish of Annesley, as well as part of Selston, in Nottinghamshire. It is proposed to acquire a portion of the gas undertaking of the Sutton-in-Ashfield Urban District Council, who are, however, to be required to continue the supply until the new works proposed to be put up by the purchasing body are completed. The powers of the Sutton Council and the Riddings District Gas Company to supply gas within the Kirkby Council's limits are to cease. The usual general powers will be applied for, as well as permission to raise money on loan.

Leeds Corporation (Consolidation).—A comprehensive Bill will be promoted by the Leeds Corporation. Among other matters, they will apply for authority to maintain, alter, or discontinue their gas-works, and supply gas within the city and the townships of Roundhay, Adel-cum-Eccup, Arthington, Rothwell, and Shadwell, all in the West Riding of York; manufacture and sell residual products, meters, fittings, stoves, engines, &c.; inspect fittings in new buildings; and alter the maximum price and illuminating power of the gas and the arrangements for testing. Provision will be made for the application of the revenue of the gas undertaking, for the creation of a reserve and depreciation fund, and for the carrying of the revenue to the consolidated or some other fund. Power will also be sought to maintain and improve the existing water-works, and supply water within and beyond the city; to increase the quantity of water the Corporation are entitled to take from their present sources, and alter the quantity of compensation water to be discharged into streams; to vary the present method of charging for water, and define what are "domestic purposes;" and to provide for the application of the revenues of the water undertaking. This part of the Bill will contain a number of provisions as to fittings and waste such as are now found in Bills relating to water supply. Additional borrowing powers will be sought.

Leeds Corporation (Water-Works Railway).—The Corporation of Leeds will apply for authority to construct temporary railways in connection with their proposed Leighton and Colsterdale reservoirs, and make a junction with the North-Eastern Railway at Masham; also to borrow the money necessary for carrying out the work.

Littlestone-on-Sea District Water.—Power will be sought for the incorporation of a Company to construct works and supply water to Littlestone-on-Sea, Lydd, New Romney, St. Mary-in-the-Marsh, Hope, All Saints, and Dymchurch, all in the county of Kent. The works will comprise two wells and pumping-stations, a service reservoir, and three conduits at Lydd, and a conduit partly in Lydd and partly in New Romney. The existing private water-works at Littlestone are to be acquired by the Company, who will ask for the powers usually granted to suppliers of water.

Llanelly Tramways and Improvement.—In a Bill for tramways and improvement purposes of which notice has been given by the Llanelly Urban District Council, provision will be made for extending the

limits of water supply by the inclusion of the parishes of Llanelly Rural and Pembrey; and the Council will ask for further powers with respect to their water undertaking.

Lytham Improvement.—Application will be made by the Lytham Urban District Council, in an Improvement Bill they intend to promote, for various powers in connection with their gas undertaking; among them being authority to advertise the advantages of the district, and pay the expenses thereof out of the surplus revenue of the undertaking, or from such other sources as may be prescribed.

Manchester Corporation.—Application will be made by the Manchester Corporation for authority to construct, in connection with their Thirlmere scheme, a service reservoir in Heaton Park and various auxiliary works, including three aqueducts, a tramroad, and road diversions. It is proposed to extend the boundaries of the city by including the urban districts of Withington, Failsworth, Droylsden, and Moss Side. Additional money powers will be sought.

Matlock and District Gas.—The Matlock and District Gas Company, Limited, will apply to be dissolved and re-incorporated with additional capital and borrowing powers; the present capital being converted. Authority will be sought to maintain and extend the existing gas-works, and supply gas in the parishes of Matlock, Matlock Bath, Darley or Darley Dale, Wensley and Snitterton, Tansley, Rowsley, and Winster, all in Derbyshire. It is proposed to reduce the illuminating power of the gas as fixed by the Company's Order of 1891. Provision will be made in the Bill for furnishing a supply of Mond or any other gas for power or manufacturing purposes; and a clause will be inserted specifying, in the case of slot meter supplies, that the Company have not been paid for the gas until the money has been actually received. Authority will be sought, among other things, to make and maintain two tramroads to connect the works with the Midland Railway.

Minehead Urban District Council.—Application will be made by the Minehead Urban District Council for authority to purchase the undertaking of the Minehead Water-Works Company, Limited, and supply water in the town and its vicinity. Power will be sought for the maintenance, enlargement, and construction of works, the acquisition of land and waters, and for other purposes. The existing funds are to be applied in carrying out the above object; and more money will be required.

Newcastle and Gateshead Water.—The Newcastle and Gateshead Water Company will apply for an extension of their area of supply, so as to include a number of places specified, all of which are in the county of Northumberland. Authority will be sought to construct two service-tanks—one in the parish of Stannington, and the other in the township of Newburn Hall—and also to supply water in bulk; but before this is furnished, the local or sanitary authority requiring it are to purchase such portions of the works as the Company may specify, or make annual or other payments in respect thereof. Additional capital will be needed.

New River Company.—Application will be made by the New River Company for authority to apportion among the shareholders, apply, and distribute the water stock to be issued to the Company by the Metropolitan Water Board as compensation, and any sums payable to the Company by the Board. It is proposed also to apply for permission to register and continue the undertaking as a land development company under the Companies Acts, 1862 to 1900, and to vest the property so registered. A Memorandum and Articles of Association are to be substituted for the letters patent and Acts now relating to the Company. Shares and securities in the proposed new Company are to take the place of those now existing. Provision will be made for the payment of the water stock, shares, and money issued in respect of shares in the Company, and for the devolution thereof.

New Romney and Lydd Water.—Authority will be sought for the incorporation of a Company with all the powers usually enjoyed by suppliers of water. It is proposed to construct works and supply water within the boroughs of New Romney and Lydd, and the parishes of Old Romney, Hope, All Saints, St. Mary's, and St. Martin's, in the county of Kent. The works comprise two wells and pumping-stations, a water tower, and three conduits or pipe-lines, all in the parish of Lydd. The other provisions of the Bill will be of the usual character.

North-Western Electricity and Power Gas.—Application will be made by the North-Western Electricity and Power Gas Company for authority to purchase additional lands at Tunstall, Stoke, Fenton, Denbigh, Wrexham, Connah's Quay, and Glossop, for generating stations. It is proposed to repeal so much of section 12 of the Company's Act of last session as prohibits the construction of stations elsewhere than on the lands described in the first schedule to that Act, as well as the 110th section, in regard to the payment of interest out of capital. The Company will ask to be empowered to acquire, from any persons within the area of supply to whom Provisional Orders have been or may hereafter be granted the undertakings authorized by such Orders, and all the rights and privileges conferred thereby. Permission will be sought to apply the funds and revenues of the Company to the objects of the Bill.

Norwich Water.—The City of Norwich Water-Works Company intend to apply for power to raise more capital by the creation and issue of debenture stock.

Oakengates, Dawley, and District Joint Water Board.—Authority will be sought for the constitution and incorporation of a Water Board for the urban districts of Oakengates and Dawley, and parts of the rural districts of Wellington and Newport, in Shropshire. The limits of supply will be defined in the Bill; and it is proposed to transfer to the Board so much of the water undertaking of the Wellington Urban District Council as lies within those limits. Powers will be sought for the construction and maintenance of works, as well as for those generally granted to suppliers of water. Provision will be made for the raising of contributions by the District Councils represented on the Board, and also for borrowing money and applying the rates and revenues.

Preston Corporation Water.—Power will be sought by the Preston Corporation to carry out certain new works in connection with their water undertaking, comprising an enlargement of the Spade Mill reservoir, a new reservoir contiguous to the present Dilworth reservoir, and six conduits or pipe-lines. They also wish to purchase the Crawshaw reservoir, and increase its depth at the north-east end. It is proposed to impound the waters of Dean Brook and its tributaries; and a pplication will be made for the inclusion of Longridge within the limits of supply. More money will be required.

Rickmansworth and Uxbridge Valley Water.—The Rickmansworth and Uxbridge Valley Water Company intend to seek power to extend their limits of supply, so as to include a number of places in Buckinghamshire, as well as Watford Rural (except certain specified portions), and St. Stephen and St. Michael Rural (except the portion included within the limits of the St. Albans Water Company) in Hertfordshire. In the Bill to be promoted, provision will be made with regard to the retention or disposal of superfluous lands.

Rotherham Corporation.—In a General Purposes Bill to be promoted by the Rotherham Corporation, clauses will be inserted to sanction a reduction in the illuminating power of the gas, extend the limits of supply, so as to include the parish of Thryburgh, in the Rotherham rural district, and so much of the parish of Wentworth as is situated within half-a-mile of the borough boundary, and define the area within which the Corporation and the Sheffield Gas Company may supply gas. Application will be sought for the amendment of section 34 of the Corporation's Act of 1870, so as to make the price to be charged for gas dependent upon the quantity consumed in a quarter instead of in a year, and for the repeal of so much of the section as prohibits the Corporation from making a differential charge for gas. Other provisions will relate to the supply of fittings, meters, &c. With regard to slot meters, the Corporation will seek to have it enacted that they shall not be deemed to have received payment for the gas consumed by means of these meters until the amount has been taken from the meter by their collector; and anyone opening or robbing a box is to be deemed guilty of an offence punishable summarily—the Corporation being empowered to take the necessary proceedings. Authority will also be sought to alter and increase the charges made for water, and to provide that the Corporation shall not be bound to supply more than one house by the same pipe. More money will be required.

Ryde Gas.—Application will be made by the Ryde Gas Company for power to define and extend their limits of supply, so as to include certain portions of Binstead and Ashey, in the rural district of the Isle of Wight. The present capital is to be consolidated and converted, and more will be applied for. Other provisions of the proposed Bill will relate to the regulation of internal fittings, the supply of gas in bulk, &c.

Selby Urban District Council.—The Council have given notice of their intention to apply for authority to construct water-works, comprising a pumping-station, a covered service reservoir, and five conduits or pipe-lines, and to supply water within certain limits to be defined in the Bill. One of the provisions in regard to water supply will be that all mines and shafts which may be sunk within a radius of five miles from any of the Council's wells shall be lined or otherwise rendered water-tight to such a depth as will prevent the abstraction of the sources of supply. The Bill will also contain a number of provisions relating to the Council's gas undertaking; but they are of the usual character. More capital will be required.

Sheppy Gas.—The Sheppy Gas Company will apply for authority to define their limits, convert and consolidate their existing capital, raise more, and create insurance and reserve funds. The Bill to be promoted will include provisions for the supply of gas for heating, incandescent lighting, and power purposes on terms to be agreed upon; and it will be specified that the power gas "need not be of any illuminating quality." The Company will also seek to be enabled to supply fittings, &c.

Shipley Urban District Council.—In a General Purposes Bill to be promoted by the Shipley Urban District Council, authority will be sought for the purchase of the gas undertaking of Sir Titus Salt, Bart., Sons, and Co., Limited, and the supply of gas in Saltaire; also for the construction of a conduit to connect the Graincliff and Eldwick reservoirs of the Council. The existing loans are to be consolidated, and more money will be required for the purposes of the undertaking.

Skipton Water and Improvement.—Application will be made by the Skipton Urban District Council for authority to construct water-works, comprising a reservoir, an aqueduct, and a road diversion, in the West Riding of the county of York. Other incidental powers, such as the right to interfere with lands, springs, streams, roads, and other property, will be applied for. It is proposed to extend the limits of supply to the parishes of Embsay-with-Eastby and Stirton-with-Thorleby in the rural district of Skipton, and to purchase the water undertaking of the Embsay Water Company, Limited. Additional capital will be needed.

Southend-on-Sea Gas.—The Southend Gas Company will apply for power to acquire additional lands for the purposes of their works, and to extend their limits of supply, so as to include North Shoebury, Great and Little Wakering, Barling, Eastwood, Sutton, Rochford, Hockley, Rayleigh, and Hadleigh, all in the county of Essex. The Company will seek to be authorized to purchase by agreement the gas undertakings of the Shoeburyness and Leigh-on-Sea Urban District Councils and the Rochford Gas Company, as well as the works belonging to certain private parties at Rayleigh. Provision will be made for increasing the qualification of the Directors, and a person is not to be ineligible by reason of his being or becoming interested in any contract with the Company. The remuneration of the Secretary is to be determined. Other matters to be included in the Bill relate to the supply of fittings, &c., and the charging of differential prices for gas.

Southend Water.—The Southend Water Company intend to apply for power to raise additional capital, and to amend their several Acts and Orders.

South Shields Gas.—The South Shields Gas Company will apply for power to make a retaining wall, embankment, and jetty at Jarrow, and carry out other works, for which additional capital will be

needed. Authority will be sought to supply power gas, in bulk or otherwise, within or beyond their limits, and to charge differential prices therefor. It is proposed to provide for the reduction of the illuminating power of the gas, and to alter the existing provisions with respect to its quality and the testing thereof. The boundary line of the Company is to be defined, and the area of the Newcastle and Gateshead Gas Company limited. The Bill will contain a number of other provisions of a miscellaneous character—one being to relieve them of any obligation to light, or to supply gas or apparatus for lighting, streets or public places, otherwise than in accordance with the Gas-Works Clauses Act.

Sutton Gas.—The Sutton Gas Company will apply for authority to consolidate and convert their capital, and raise more money. Power will be sought to extend the works, frame regulations as to internal fittings, alter the price of gas, form renewal, reserve, and insurance funds, and make other provisions incidental to the supply of gas,

Swindon Corporation.—In a General Powers Bill to be promoted by the Swindon Corporation, provision will be made for the preferential payment of water-rates in bankruptcies, for the construction of subsidiary works in connection with the water undertaking, and for carrying into effect other proposals in regard thereto.

Thurles Urban District Council Water.—The Thurles Urban District Council will seek authority to construct a reservoir and other works, with a new road or right of way thereto, and to take water, springs, and streams compulsorily. The limits of supply are to be defined, and provisions made for the protection of the sources of supply. Borrowing powers will be required.

Ticehurst and District Water and Gas.—Application will be made for authority to amalgamate the undertakings of the Ticehurst and Robertsbridge Water Company and the Wadhurst, Ticehurst, and District Gas Company. The Bill will contain the necessary provisions for changing the name, extending the area of supply for both water and gas to include Heathfield, and constructing additional water-works, consisting of a well and pumping-station, a service reservoir, and two pipe-lines. More capital will be required.

Tynemouth Gas.—Authority will be sought by the Tynemouth Gas Company to extend their works on land adjoining that now belonging to them in the parish of Chirton, in the borough of Tynemouth, and to acquire other land. It is proposed to extend the limits of supply, so as to include the civil parish of Earsdon, in the county of Northumberland. In the Bill to be promoted, provision will be made for reducing the standard illuminating power of the Company's gas and for testing it, as well as for amending sections 39 and 40 of the Tynemouth Gas Act, 1897, with respect to the supply of gas to the public lamps. Provisions now usual in Gas Acts will be included, among others the power to charge differential prices. Additional capital will be needed.

Wallasey Tramways and Improvements.—In a Bill to sanction the construction of tramways and the carrying out of certain improvements in the town, the Wallasey Urban District Council will apply for an extension of time for the purchase of lands for a railway to their gas-works, and for constructing it. They will also ask to be empowered to make better provision in regard to their gas, water, and electricity undertakings.

Wellington (Somerset) Gas.—The Wellington Gas Company desire to be dissolved and re-incorporated with additional powers. The Bill to be promoted will contain the usual provisions for the raising of more capital; the continuance, construction, and maintenance of gas-works; the supply of gas, meters, fittings, &c.; regulating the price, quality, and pressure of gas, and the size and material of pipes and fittings; and levying and recovering rates and charges. Authority will be sought to apply for electric lighting powers.

Whitby Gas.—Application will be made by the Whitby Gas Company for authority to purchase certain lands and construct gas-works; erect, purchase, or take on lease dwelling-houses for persons in their employ; and raise additional capital. Provision will be made for the issue of shares or stock to proprietors, consumers, or employees.

Withnell Gas.—Application will be made for the incorporation of a Company to construct works and supply gas within the township and urban district of Withnell, in Lancashire. Among other things, the Company will ask to be enabled to supply gas produced by the Mond or other process for purposes of power, heating, or incandescent lighting; also to obtain authority to produce and sell electricity.

Yorktown and Blackwater Gas.—The Yorktown and Blackwater Gas Company, Limited, desire to be dissolved and re-incorporated, with change of name, and with power to supply gas in the parishes of Sandhurst and Crowthorne, in Berkshire, and parts of Frimley, in Surrey, and of Hawley, Minley, and Yately, in Southampton. It is proposed to ask for the repeal of the provisions of the Ascot District Gas Act, 1882, which authorize the Ascot Company to supply gas within the limits to be defined in the intended Act. Power will be sought to acquire land, maintain and extend the existing works, and construct new ones, as well as a railway; to sell gas in bulk; to supply meters, fittings, stoves, &c.; and to apply for a Licence or Provisional Order under the Electric Lighting Acts. The existing capital is to be defined and regulated, and more will be required.

PROVISIONAL ORDER APPLICATIONS (SESSION 1904).

To the Board of Trade, under the Gas and Water Works Facilities Act, 1870.

Appleby Gas.—The Appleby Gas Company will seek power to maintain and continue, and from time to time enlarge, their works, supply gas in the borough of Appleby, and purchase additional lands for the purposes of their undertaking.

Bognor Gas.—The Bognor Gas Company, Limited, intend to apply for power to construct works for the manufacture and storage of gas and residual products on land already in their possession, and to extend their limits of supply so as to include so much of the parish of Pagham as is known as the village of Aldwick, and also the parishes of Barnham and Eastergate, all in the rural district of the Westhampnett Union, in the County of Sussex. It is proposed to increase the capital.

Bradfield Water.—Application will be made for authority to maintain and continue water-works, and to supply water to the parish of Bradfield, in Berkshire. The usual powers will be sought.

Cholderton and District Water.—Application will be made by Mr. Henry C. Stephens, of Cholderton, for authority to construct works and supply water in that parish and Bulford, both in Wiltshire, and also in Shipton Bellinger, Thruxton, Amport, and Quarley, in the county of Southampton. The works will comprise pumping-stations in the two first-named places, four reservoirs, softening plant, and pipe-lines. The usual capital and like powers will be applied for.

Elham Valley Gas.—Application will be made for authority to construct and maintain gas-works, and supply gas and residual products in Elham, Lyminge, Postling, Saltwood, and Stanford, in Kent, or some of them. The usual powers will be required by the applicants.

Elham Valley Water.—Application will be made on behalf of a Company or certain parties to be named for authority to construct works and supply water in Lyminge, Elham, Postling, Stanford, and Saltwood, in Kent. Provision will be made for the sale or lease of the undertaking, or any part of it.

Elstree and Boreham Wood Gas.—The Elstree and Boreham Wood Gas Company, Limited, intend to apply for powers to raise further capital, to the amount of £14,000, in order to enable them to carry out the undertaking authorized by the Orders obtained in 1872 and 1899.

Finedon Gas.—The Finedon Gas Company, Limited, will seek power to maintain and continue their existing works and construct additions thereto, manufacture and supply gas-engines and fittings, and generally carry on the business of a gas company. Further capital will be sought.

Frimley and Farnborough District Water.—The Frimley and Farnborough District Water Company will apply for power to extend their limits of supply, so as to include the parish of Winchfield, in the rural district of Hartley Wintney, in the county of Southampton. Additional capital will be needed.

Godalming Gas.—The Godalming Gas Company will make application for power to extend their limits of supply so as to include the parish of Chiddingfold, Surrey, and to supply gas therein. Additional capital will be required.

Grays Gas.—Power will be sought by the Grays Gas Company, Limited, to construct a holder and other works for the manufacture and storage of gas and residual products on lands belonging to them adjacent to their existing property, and also to raise additional capital.

Meldreth Gas and Water.—The Meldreth and Melbourn District Gas and Water Company, Limited, will apply for authority to define their limits of supply, so as to include the parishes of Meldreth, Melbourn, and Shepreth, in Cambridgeshire; to erect works for the manufacture and storage of gas and residual products, and for the storage and supply of water; to purchase lands; and to raise the capital necessary for the purposes of the undertaking.

New Hedon Gas.—The New Hedon Gas and Coke Company, Limited, will apply for power to maintain and extend their existing works, and supply gas in the parishes of Preston and Paull and the borough of Hedon, in the East Riding of York, acquire additional lands, and levy rates and charges.

Northampton Gas.—The Northampton Gaslight Company will apply for authority to raise additional capital, and for further powers in connection with their undertaking—including the exemption of engines, meters, stoves, and fittings, from distress, the supply of gas in bulk, and other matters.

North Sunderland Water.—Application will be made by the Trustees of Lord Crewe's Charity for authority to construct and maintain works, and supply water within the parishes of Ellingham, Chathill, Swinhoe, Fleetham, Elford, and North Sunderland, in the county of Northumberland. The powers usually granted to suppliers of water will be sought.

Rainham Water.—The Rainham Water-Works Company, Limited, intend to apply for power to maintain and continue their present works, and supply water in the parishes of Rainham, Upchurch, and Hartlip, in the rural district of Milton, and in the parishes of Bredhurst and Stockbury, in the rural district of Hollingbourne, all in Kent. The capital is to be defined and more will be required.

Rochford Gas.—The Rochford Gas Company will apply for power to continue their present undertaking, purchase additional land, and manufacture and supply gas within the parish of Rochford and certain portions of the adjoining parishes of Eastwood, Hawkwell, and Little Stambridge, all in the county of Essex. The existing capital of the Company is to be defined and regulated, and provision will be made for increasing it.

Romford Gas.—The Romford Gas Company intend to apply for additional capital, as well as for power to maintain and extend gas-works on certain lands specified and purchase other lands for the purposes of their undertaking.

St. Margaret's Gas.—The St. Margaret's Gas Company intend to apply for authority to continue their existing works, construct additions thereto at Great Amwell, in Hertfordshire, and supply gas in the parishes of Stanstead St. Margarets, Stanstead Abbotts, Roydon, and Great Amwell, with the usual powers.

Sevenoaks Water.—The Sevenoaks Water Company will apply for authority to acquire and hold additional land for the general purposes of their undertaking.

Southwold Water.—Authority will be sought by the Southwold Water Company to construct additional works, comprising a pumping-station, wells, and pipe-lines, in East Suffolk, and to extend their limits of supply so as to include the parishes of Reydon and Eastern Bayvents, both in the rural district of Blything, in the above-named county. Additional capital will be required.

Stanford-le-Hope Gas.—Application will be made by the Stanford-le-Hope Gas Company for authority to construct and maintain gas-works at Horndon-on-the-Hill, and supply gas in various parishes in Essex under the usual conditions.

Waltham Abbey and Cheshunt Gas.—Power will be applied for by the Waltham Abbey and Cheshunt Gas Company to construct and maintain additional gas-works; purchase, erect, or take on lease dwelling-houses for persons in their employ; raise more capital; and supply meters, stoves, fittings, &c.

Wetherby Water.—Application will be made by the Wetherby District Water Company for authority to raise additional capital and issue additional preference shares in respect of that now existing.

Worsbrough Dale and Worsbrough Gas.—Authority will be sought to maintain and continue the existing gas-works, and supply gas in the township and urban district of Worsbrough, in the parish of Darfield, in the West Riding of York. Additional capital will be needed.

Worthing Gas.—The Worthing Gas Company will apply for power to raise additional capital by auction or tender, and provision will be made for the issue of shares or stock to the proprietors, the consumers, or the employees of the Company. The existing 10 per cent. stock is to be converted into 5 per cent. stock. The Order will contain the ordinary provisions relating to the supply of gas.

To the Local Government Board, under the Public Health Act, 1875, and the Gas and Water Works Facilities Act, 1870.

East Dereham Gas.—The East Dereham Urban District Council intend to apply for a Provisional Order to amend the Order obtained by them in 1875, so as to authorize them to purchase or hire, and sell or let on hire and otherwise deal in and fix gas-fittings; also to empower them to raise £10,000 of capital beyond the £15,000 sanctioned by that Order.

Neyland Gas.—Application will be made by the Urban District Council of Neyland, in Pembrokeshire, for authority to manufacture and supply gas and residual products within their district, to acquire a portion of the undertaking of the Pembroke Docks and Town Gas Company, and to purchase gas in bulk. The usual powers will be sought, as well as permission to borrow money.

To the Secretary for Scotland, under the Private Legislation Procedure (Scotland) Act, 1899.

Airdrie Corporation Gas.—The Corporation of Airdrie notify their intention of applying for authority to purchase, by compulsion, or agreement, the undertaking of the Airdrie Gas Company, and so much of that of the Coatbridge Gas Company as lies within the parish of New Monkland. It is proposed to amend the Act under which they claim a right to supply gas within that parish. General powers to carry on the undertaking, levy rates and charges, supply meters and fittings, &c, will be sought, as well as permission to raise more money.

Airdrie Gas.—The Airdrie Gas Company desire to be dissolved and re-incorporated with the usual powers granted to gas companies. The limits of supply are the municipal boundaries, as defined in the Airdrie Burgh Extension Act, 1885, and the parishes of New Monkland and Shotts, in the county of Lanark, with the exception of a portion of the former parish specifically indicated; and it is proposed to amend the Coatbridge Gas Act, 1877, and alter the limits of the Coatbridge Company so that they shall not supply gas within those of the Airdrie Company. The other powers usually granted to suppliers of gas will be sought; and provision will be made for enabling the Company to obtain authority to produce and supply electrical energy. More capital will be applied for.

Arbroath Corporation Water.—The Corporation of Arbroath intend to apply for authority to construct works, comprising two service reservoirs and four conduits or pipe-bins, and an access road; acquire lands, springs, &c.; and make agreements, with local authorities and others for the supply of water in bulk. Further money powers will be sought.

Dumbarton (Vale of Leven) Water.—Power will be sought by the County Council of Dumbarton and the Western District Committee thereof to acquire lands and construct additional water-works, consisting of a reservoir, an embankment, a flood watercourse, and an aqueduct or pipe-line, for the supply of water to the Vale of Leven special water district and other parts of the western district of the county. It is proposed to sell portions of the works to local railway companies, who are to contribute to the costs of the new scheme. Additional powers will be required.

Dunfermline District Water.—Authority will be sought by the Dunfermline District Committee of the Fife County Council to construct water-works, consisting of a reservoir in the Glenquey Burn, an embankment across the burn, two conduits or pipe-lines, and auxiliary works. Provision will be made for the abolition of several special water districts, and the purchase of the share or interest of Inverkeithing and Culross in certain water-tanks, mains, and pipes. Additional borrowing powers will be applied for.

Grangemouth Burgh Extension.—The Corporation of Grangemouth will apply for power to extend their limits, and consequently to include within the area of compulsory water supply the districts proposed to be annexed.

Melrose Water.—Power will be sought by the County Council of Roxburgh and the Melrose District Committee of that body to acquire lands and easements and construct works for the supply of water in the parishes of Melrose (exclusive of the police burgh), Bowden, Lilliesleaf, St. Boswells, and Maxton. Certain special water supply districts are to be dissolved. Provision will be made for the prevention of pollution and waste of water, levying of rates and charges, &c. Borrowing powers will be applied for.

Stirling Gas.—The Stirling Gaslight Company intend to apply for authority to increase their capital and alter the quality of their gas. In regard to the latter proposal, they will ask for an amendment of their Act of 1898.

Wishaw Corporation.—The Corporation of Wishaw will apply for power to borrow more money for the purposes of their water undertaking, and to levy additional rents, rates, and charges.

LEGAL INTELLIGENCE.

Taking Locomotives Over a Water Company's Bridges.

In the Chancery Division of the High Court of Justice on Saturday, Mr. Justice Buckley had before him a case in which an order had been granted by the Vacation Judge, restraining one Gauldie from taking locomotives over any of the bridges of the New River Company. Application was now made for judgment on agreed minutes. Mr. Seddon represented the Company. Mr. Gauldie appeared in person. Mr. Seddon said the defendant was willing to have the injunction made perpetual and to pay £2 as nominal damages and the costs of the action. His Lordship asked whether the defendant would give a perpetual undertaking in the terms of the injunction; and, on being answered in the affirmative, made an order as arranged.

Fine for Disconnecting a Gas-Meter.

At Liverpool, last Wednesday, Walter Woods, cycle manufacturer, was summoned at the instance of the Gas Company for unlawfully disconnecting a gas-meter from the pipe supplying such meter, without having given notice of his intention to do so, with unlawfully and fraudulently abstracting gas from the main, and with unlawfully and fraudulently consuming that gas without paying for it. It was stated that on the 12th ult. an inspector went to defendant's premises, and found the pipes were disconnected. An india-rubber tube was used; the gas being taken from the main on the street side of the meter. Defendant stated that he had used the tube to see whether a fault which he complained of lay in his pipes or the meter. On Oct. 27, defendant telephoned to the Company stating that the gas supply was deficient. A man was sent up, who said that the fault lay in the water-logged pipes, and advised him to have them tapped. Nothing further was heard from him until the visit of the inspector. Defendant admitted all the information; but it was urged on his behalf that, though he had committed a technical offence, there was no intention of fraud. It was necessary that he should have light to carry on his work; and he was very busy at the time. Two informations were withdrawn, and defendant was fined £3 and costs on the third.

Theft by a Gas Company's Servant.

At the Bristol Police Court, on Friday, before his Honour Judge Austin and Alderman E. B. Colthurst, Frederick Hillier, in the service of the Bristol Gas Company, was charged with stealing certain sums of money and articles from the houses of residents in the city. The prosecution was undertaken by Mr. W. H. Birch, on behalf of the Company. He informed the Magistrates that the prisoner's practice had been to enter a shop or house on the pretext of examining the gas-meter. He would tell the occupier that either this or the fittings were out of order, and induce the persons to leave the rooms, so that he could have the opportunity of making the repairs. While they were absent, he filched what goods he could lay his hands upon. Evidence was given by Sophia Thomas, of Ducie Parade, who stated that on the 24th of November the prisoner came to her shop to repair the meter. He was engaged there for a short time alone. While she was out of the room, she heard the till fall to the floor, and on going in again found it half-way out, and 2s. 6d. missing. Prisoner denied having tampered with the till, but was given into custody. Hillier told the Magistrates that while he was repairing the meter a boy came into the shop. Prisoner had never touched the till, and he did not hear it drop to the floor. Other charges were not gone into. In passing sentence of three months' imprisonment with hard labour, his Honour said it was sad when a man in prisoner's position abused the liberty it gave him.

Artesian Well Borings in London.—An artesian well has been sunk to a depth of 450 feet at the offices now in course of erection for the Royal London Friendly Society, Finsbury Square; and it is reported that a supply of more than 2000 gallons of pure water per hour has been obtained. Messrs. Alfred Williams and Co., who have the contract, are fitting a deep-well pump, which is lowered down the borehole about 100 feet below water-level. The success of this work, in conjunction with results obtained from other artesian wells in London, is regarded as showing that the water supply from the chalk beds under London is perfect in quality and inexhaustible.

London County Council and Local Loans.—At the meeting of the St. Pancras Borough Council on Wednesday, the receipt of a letter from the Comptroller to the London County Council (Mr. H. E. Haward) was reported, intimating that a required loan of £23,960 for electricity purposes, repayable in 42 years, could only be advanced to the Council at $3\frac{3}{4}$ per cent. per annum, instead of $3\frac{1}{2}$, the rate of interest which previously obtained in the case of local loans. The Comptroller added that the Finance Committee of the County Council desired to take the opportunity of emphasizing the desirability, in view of existing financial conditions, of the borrrowings of local authorities being restricted, as far as possible, to schemes of an urgent character. Inasmuch as the Prudential Assurance Company offered to advance St. Pancras the needed loan at £3 12s. 6d. cent. per annum, the Borough Council decided to seek the sanction of the County Council for the acceptance of this offer.

MISCELLANEOUS NEWS.

EDINBURGH AND LEITH GAS SUPPLY.

Developing the Granton Works.

At the Meeting of the Edinburgh Corporation yesterday, an important report on the subject of further developing the new gas-works at Granton, which have been fully described in the "JOURNAL," was brought up by the Gas Commissioners. It was presented to them on the 7th inst. by the Engineer (Mr. W. R. Herring, M.Inst.C.E.), in compliance with a remit to him on the 14th of September, and referred to the Works Committee, who approved of it, and instructed him to proceed with getting in estimates for the work proposed. The following is the text of the report.

In accordance with your remit of the 14th of September, I have now fully considered the question as to the advisability of proceeding immediately with constructional works at Granton sufficient to take up the balance of our midwinter requirements, and for which we are at present dependent upon the old plant at the New Street works.

I estimate that during the coming winter we shall require assistance from the New Street works to the extent of about 10 million cubic feet per week. As it will take four years to equip the Granton works with what may be termed a half-section, I estimate that by the winter of 1907-8 we shall require to work the New Street works to the extent of 21 million cubic feet per week; so that, assuming we equip the Granton works with another half-section of plant, we should, in the winter of 1907-8, have a reserve on hand equal to 23 per cent. of our total output. The general rule with regard to the capacity of a gas-works in relation to its maximum week's output is that there should be a reserve of 20 per cent. in hand to allow for extraordinarily inclement weather, mishaps, and other contingencies that so often arise, and otherwise to cover periods during which structural additions are being made.

Under the circumstances, it does not therefore appear to be too early to commence such constructional operations at Granton as will have the effect of removing entirely, for good and all, the manufacturing plant from the centre of the city. The present is a particularly opportune time to commence such structural additions. The price of iron and steel is very low—perhaps as low as it is likely to be in the near future; building materials, and all such as we require, being much cheaper now than when the first section of the works was being constructed. The cost of equipping the Granton works with the necessary plant and buildings to accomplish this object, will, I estimate, amount to £200,000. The interest and sinking fund charges on this sum, at 4¼ per cent. per annum, will amount to £8500 per annum, which represents about 1d. per 1000 cubic feet of gas sold. This charge will only be proportionate per annum on the amount of money spent, and until the proposed extensions are brought into operation.

When the proposed works are ready for manufacturing gas in the winter of 1907-8, I estimate that they will be required to yield 21 million cubic feet as a maximum week's output, and that they will require to work more or less for a period of three months, producing in all from 80 to 100 million cubic feet. The economy in manufacturing this gas under the new conditions at Granton, as compared with the old conditions in Edinburgh, will represent a saving of £2388 per annum. There is also the additional advantage of abandoning the establishment which must otherwise be kept going at present at the New Street works as an in-town station. At the minimum, I estimate that this will cost £2500 per annum; these items jointly representing a sum of £4888 towards paying the interest and sinking fund charges on the proposed capital expenditure at Granton. In addition to this, however, the proposed scheme will set at liberty, and for sale, the very valuable site of the New Street works. All things considered, therefore, it appears that the constructional work at Granton could be undertaken and accomplished without throwing any additional burden upon the gas consumer when once the transfer can be completed.

In laying down the first section of the works at Granton, provision was made in many instances for the additions now contemplated. The drainage scheme is already in existence, excepting the actual drainage of the particular buildings to be put up. The meter-house and pumping-station buildings are sufficiently large to contain the apparatus that would be put into them. The general railways on the works are sufficient for this section, only those immediately in connection with the new buildings requiring to be laid; likewise the general yard formation, workshops, railway station, traffic offices, and stores.

In the event of your approving of our proceeding with this work, I would suggest that you give me immediate instructions to proceed with the drainage and railway work required for the new section, as these will take some considerable time to put down, and, when down, will very greatly facilitate the after constructional operations, and bring about considerable economy in the cost of their execution.

METROPOLITAN WATER ARBITRATION.

(*Before the Right Hon. Sir* EDWARD FRY, *Sir* HUGH OWEN, G.C.B., *and Sir* JOHN WOLFE-BARRY, K.C.B.)

Seventeenth Day.—Monday, Nov. 23.

The case of the New River Company was resumed this morning.

Mr. *Samuel Wood*, of Messrs. Wood, Drew, and Co., was the first witness called for the Company. In reply to Mr. CRIPPS, he dealt at great length with the Company's accounts, which gave a total capitalized value of £13,139,377, to which was added expenses in regard to the Staines supply. These figures did not include the value of the surplus lands. They were estimated at £160,000, exclusive of the Clerkenwell estate.

Mr. MOULTON: By the decision of the Court on Saturday, the dividend of the undertaking is limited to 10 per cent.; and if the Companies choose to retain the surplus lands, they must account to the Water Board for them.

The PRESIDENT: Are you agreed that they are to be taken as part of the undertaking?

Mr. MOULTON said that some of them were, undoubtedly.

Mr. BALFOUR BROWNE: I am willing to sell the lands to the Water Board.

Mr. CRIPPS said the Companies were not willing to have them in as part of the undertaking.

Mr. MOULTON submitted that the Tribunal could not settle the value of any lands that were bought; and therefore they had to find out those which were part of the undertaking.

In reply to certain questions by the PRESIDENT, witness said that the whole of the surplus lands were entirely outside his accounts. Apart from the Clerkenwell estate, the lands had always been introduced into the Company's accounts, and had always been audited by the Company's Auditor since 1871 as part of the undertaking. Witness then presented tables which showed the capital authorized, raised, expended, and employed, the capital expenditure, the average daily supply of water and number of supplies, the income, working expenses, maintenance, management, net revenue account, and the corrected revenue and net revenue accounts for the years ended Dec. 31, 1901 and 1902. The ordinary capital authorized at Dec. 31 last amounted to £2,019,958, under the Acts of 1852 and 1866; the nominal amount raised and cash realized was £2,019,958. The 4 per cent. debenture stock authorized amounted to £1,500,000 (under the Acts of 1854 and 1879); nominal amount raised £1,500,000; cash realized, £1,555,412. This stock was irredeemable. The 3 per cent. debenture stock was: Capital authorized, £1,456,026 (under the Acts of 1896, 1897, and 1899); nominal amount raised, £708,000; and cash realized, £696,332. The totals at Dec. 31 last were: Capital authorized, £4,975,984; nominal amount raised, £4,227,958; and cash realized, £4,271,702. A further sum of £250,000 of "D" debenture stock was raised in 1903, realizing £241,941. The capital expenditure of the Company to Dec. 31, 1870, was £2,642,567. From 1871 to 1902, the amount was £1,661,161; making a total of £4,303,728. Witness then put in statistics as to the average daily supply of water, and the number of supplies, compiled from the monthly returns of the Official Water Examiner, commencing with the year ending Dec. 31, 1880, and terminating in 1902. The revenue accounts (in accordance with the certified accounts of the Company, but showing the corrected figures also) showed the net water-rental to be: In 1880, £400,656, 9·31d. per 1000 gallons, and £3·06 per supply; 1902, £604,942, 10·02d., and £3·44. The corrected figures were: 1902, £602,214, 9·97d., and £3·43. The profit on water was in 1880, £261,761, 6·08d. per 1000 gallons, 65·23 per cent. on the net rental, and £2 per supply; 1902, £341,788, 5·65d., 56·50, and £1·95 respectively. The corrected figures for 1892 were: £343,103, 5·68d., 56·97, and £1·95. The net revenue accounts, according to the certified accounts of the Company, gave the net profit available for dividend in 1880 as £219,356, 5·09d. per 1000 gallons, and 10·86 per cent. on the ordinary capital; 1902, £246,144, 4·07d., and 12·19. The corrected figures were: 1902, £247,096, 4·09d., and 12·23. In 1880, the dividend for the year was 11·04 per cent. on the ordinary capital; the amount being £222,946, or 5·18d. per 1000 gallons—the deficiency being £3590. In 1902, the dividend was 12·60 per cent. on the ordinary capital; the amount being £254,527, or 4·21d. per 1000 gallons—the deficiency being £8383. The dividends per cent. paid on the ordinary capital in each year from 1880 to 1902 were: 11·04, 11·51, 11·68, 11·94 (in 1883, 1884, and 1885); 11·95, 11·94 (from 1887 to 1892, both years inclusive); 12·03, 12·36, 12·36, 12·70, 12·98, 13·31, 13·66, 13·64, 12·60, 12·60. The Accountants to the Water Board claimed to make additional charges in 1902 under the heads of land tax, Parliamentary expenses, sinking fund, depreciation, Crown Clog, and Hardwick's Gift. Witness also put in a table giving the estimate of future net divisible earnings. The dates were: Dec. 31, 1903, June 24, 1904, 1905, 1906, 1907. The debenture stock (always excluding "D" stock) was put in 1903 at £1,808,000; water-rental (always increasing at 1·97 per cent. per annum), £665,485; less working expenses, £241,371; profit on water, £424,114; total deductions, £71,320; balance after charging sinking fund (£16,232), £336,562. For 1904: Debenture stock, £672,040; less working expenses, £243,749; profit on water, £428,291; deductions, £27,470; balance after charging sinking fund (£16,020), £339,801. 1905: Debenture stock, £1,880,000; water-rental, £685,279; less working expenses, £248,551; profit on water, £436,728; deductions, £74,070; balance, £346,715. For 1906: Debenture stock, £1,892,000; water-rental, £698,779; less working expenses, £253,477; profit on water, £445,332; deductions, £74,430; balance, £354,580. 1907: Debenture stock, £1,904,000; water-rental, £712,545; less working expenses, £258,440; profit on water, £454,105; deductions, £74,790; balance, £362,557. The capitalization was taken as follows: Divisible profit for the year ending June 24, 1904, £339,801; multiplier, 36·3636; capital amount, £12,356,400. Additional profit for 1905, £6914; multiplier, 35·390; capital amount, £244,686. Additional profit for 1906, £7865; multiplier, 34·443; capital amount, £270,894. Additional profit for 1907, £7077; multiplier, 33·521; capital amount, £267,397. Total profit, £362,557; total capital amount, £13,139,377. The total claim, *plus* expenses in connection with the Staines supply (£115,241), and interest thereon (£5546), was £13,260,144, to which a supplemental claim would be made in respect of surplus lands The Company were at present undercharging as follows: In the City of London (3663 cases), £32,871 17s. 10d.; City of Westminster (344), £3107 9s.; Borough of Holborn (373), £2198 1s. 2d.; Finsbury (503), £1961 5s.; Shoreditch (345), £1234 5s. 8d.; Stepney (15), £55 5s. 6d.; Islington (1076), £1914 5s. 6d.; St. Pancras (827), £1857 9s.; Hackney (195), £280 7s. 8d.; Hampstead (143), £230 16s. 4d.; and Stoke Newington (131), £202 8s. 4d. Grand totals, 7615 cases, £45,913 11s., to which was added for undercharges left out of the above (estimated) £4500; making a grand total of £50,413 11s.

In cross-examination by Mr. MOULTON, witness said his tables representing what the estimated net divisible profits of the Companies would be in 1903 and 1904 were arrived at on certain assumptions. First,

that the Companies would increase the water-rental by £50,000; secondly, that the water-rental would increase at the same rate as it had done in the past ten years; and, thirdly, that the amount of working expenses would be continued as estimated by the Engineer.

Mr. MOULTON: Do you think these assumptions probable?

WITNESS: I am not in a position to say whether the £50,000 increased water-rental is actually obtainable.

Do you believe that if the Companies had gone on to 1904 there would have been this sudden jump of £50,000 in the water-rental?—I should say it was doubtful. I cannot say to what extent. I think the Companies would do so if it was necessary for them to obtain the sum in order to pay their way.

The witness was cross-examined at considerable length upon the figures which he produced.

Mr. *Joseph Francis*, in answer to Mr. CLAUDE BAGGALLAY, put in a descriptive statement of the works of the New River Company. The sources of the Company's supply were excellent and ample. With regard to the wells, they did not show any tendency to exhaustion. They were situated in the open chalk, and had never shown any diminution whatever. The two or three nearer London had shown some small reduction; but works had been undertaken to bring them up to what they would yield.

Mr. BAGGALLAY: Is the yield from the wells which you get, and the level of the wells, as high as in the past?

Witness: The level of the wells in the open chalk is as high as it ever was, but there has been a falling off in those close to London to a certain extent—not at the same rate as the fall in London itself. It does not affect the supply really—it does not affect the quantity we get from the wells.

Has there been any interference with other wells in the neighbourhood?—Any other well that happened to be within the cone of depression of one of our wells would be affected; but the general level of the water outside the cone of depression is unaffected.

Does the cone of depression extend far from your well?—As a rule it does not extend very far; but chalk is very uncertain in some cases. In one direction it may extend some little way, but never all round to any great distance. Sometimes there are fissures which lead in a particular direction; and then another well at a considerable distance may be affected. The Chadwell Spring itself is an example of this. There is water coming from a very long distance by a direct channel apparently.

Have you actually seriously interfered with any wells?—No, except those very close to our own.

Is there extra expenditure likely to fall upon the Companies in regard to renewals of mains and plant, as suggested by the Water Board, or have your mains and plant been properly maintained up to the present time?—Oh, yes; such sums have been spent in the past that everything is in perfect working condition.

Eighteenth Day.—Tuesday, Nov. 24.

Mr. *Joseph Francis*, re-called, in further examination by Mr. BAGGALLAY, said that the works and mains had been restored from time to time where portions had become worn out and exhausted. They were, in fact, kept up year by year in a full state of repair, and quite capable of doing their work. The 17 acres of filter-beds were ample to do all the filtration required by the Company, and also gave sufficient margin for a stand-by during cleaning.

Mr. BAGGALLAY: Are you at present carrying out the works under the Act of 1897—that was the Act which was to enable your Company to construct a main and the necessary additional works for utilizing their share in the Staines reservoir undertaking when they had occasion to use that water?

Witness: Yes. Some contracts have been completed, and others are now in hand.

Continuing, witness said that the communication-pipe constructed under the powers of the 1897 Act could only be used for bringing water from the Staines reservoirs. None of the properties mentioned in the schedule now put in were at present being employed for water-works purposes, though one or two of them were at one time acquired with this object.

In cross-examination by Mr. MOULTON, witness said the present storage was equal to about four days' supply.

Mr. MOULTON: Sufficient to equalize the pressures. But you do not really rely upon storage as increasing your resources?

Witness: To a very small extent.

Yours is a day-by-day supply and a day-by-day consumption?—Yes.

You have told the Court what the supplies are—22½ million gallons from the Lea, a quantity by pumping from the wells, and also the spring?—Yes.

What is the supply from the spring? It depends on the time of year and the season. Sometimes the supply from the spring is absolutely nothing; so that when I am calculating what our resources are, I leave it out. But at other times it is a very valuable asset indeed. At present, we are getting from it nearly 4 million gallons; and it is really delivering a good deal more.

It is a source that cannot be relied upon in periods of drought; but at other times it may be a very convenient supply?—Yes; and economical.

Witness (continuing) said he had had experience of the spring since 1863, and had never known it to fail till 1898. But in the earlier years, the spring was only gauged at very long intervals. Now it was gauged constantly. Since 1898, there had been a leakage from the spring, so that when the discharge got below a certain point all that came was absorbed, and the Company did not have the benefit of its flowing into the channel of the New River. The day-by-day supply, of course, varied in different months; and the Company were therefore obliged to see that their resources (where they had not any storage) were sufficient to meet this variation. The resources from wells and river must be equal to about 25 per cent. more than the average demand.

Mr. MOULTON: Taking the supply from the river, you have the power to abstract 22½ million gallons at the intake at Hertford.

Witness: Yes; between Ware and Hertford.

Are you always able to get this quantity?—Always, except during extremely droughty seasons. Whenever there is a series of very bad years, as we have had lately, there may be a slight falling off.

In reply to further questions, witness said the available supply from the wells was 28 million gallons. The daily draught during August, 1899 (one of the maximum months) was 26⅜ million gallons. The new works would cost about £1,200,000. Works costing £819,000 had already been contracted for; and the total expenditure would be reached in about two years.

Re-examined by Mr. BALFOUR BROWNE, witness stated that, by the Act of 1897, fifteen years had been given to carry out the works. The reservoirs at Staines would be of substantial benefit to the public. When completed they would be filled with Thames water. They had largely increased the well supply. He agreed with the opinion of the Engineer to the London County Council that the filtered water of the Lea which the Company used was next in purity to that of the Kent Company. The New River Company had pumped in one day 33 million gallons of water from their wells. The daily requirement for the year from the wells was 18½ million gallons; and the average daily supply from this source for the year had been 26 millions.

Mr. *E. L. Morris*, in reply to Mr. PEMBER, said he had been for several years in charge of the pumping and filtering departments. He had prepared the book which had been put in containing a description of the pumping machinery of the New River Company.

The PRESIDENT, after a brief consultation with his colleagues, said: We are rather of opinion that you have given sufficient evidence of the maintenance of the works and their condition, the adequacy of the supply, and the purity of the water. I think you may consider that the burden rests upon the other side to prove the opposite. Of course, you would probably put in witnesses more in detail for cross-examination.

Mr. BALFOUR BROWNE said Professor Dewar and Sir William Crookes were in attendance; but he did not think it would be necessary to call them unless Mr. Moulton desired to see them.

Mr. MOULTON said he intended to show that the filter-beds should be doubled. He did not propose to contest the points about the works and mains being in good condition. The Board had never denied that. As to the purity, he did not think this could be carried further than the filtration.

The PRESIDENT: Then, Mr. Balfour Browne, you had better call Sir W. Crookes as to the filtered water.

Mr. MOULTON: No one says they have not got enough supply for to-day. Our case is that it is absolutely necessary that they must have these further supplies in the immediate future. I think we can show that from the evidence we have already received.

Mr. BALFOUR BROWNE: I follow that. Then, with regard to the question of filtration, I propose not only to call our Chemists as to the quality of the water given, which bears upon filtration, but also Engineers to show that the rate of filtration is excellent and right. We have here a very able Geologist (Professor Boyd Dawkins) with regard to the level of saturation, and the pumping from the wells generally; but I think, after your decision, I have made out a *prima facie* case.

The PRESIDENT: You can put him into the box and ask him a short question with regard to that.

Mr. PEMBER (continuing) asked witness questions with regard to the filter-beds. Witness, in reply, said that there were three stations where the water was filtered—Stoke Newington (9 acres), New River Head (2¼ acres), and Hornsey (5½ acres)—making a total of 16¾ acres. The combined capacity of all the pumping-engines was 47,275,000 gallons.

Professor *Dewar*, questioned by Mr. BALFOUR BROWNE, said he and Sir W. Crookes had examined the water of the New River Company in the same way as that of the East London Company—the water from the Lea, and also the water as delivered by the Company to their consumers. The water from the Lea was better than that of the Thames. It had been tested not only chemically, but for the number of bacteria in a certain quantity of water.

Mr. BALFOUR BROWNE: If filtration was defective, would that at once appear by your examination?

Witness: It would.

Do you find the water as supplied an excellent water?—Yes. That is proved by the returns which are given month by month, which are already printed.

You have prepared a table showing the number of times the filtered water supplied by the Company had not been perfectly clear and bright from 1880 to 1902?—Yes; and also a table with regard to the examination for specific bateria. In 1880, there were four times when the water was not perfectly clear and bright; from 1881 to 1888 inclusive, there were no occasions; in 1889, there were three; in 1890, none; in 1891, three; in 1892, two; in 1893, four; and since 1894, none.

Were those four cases in 1893 communicated to the Company at once?—Yes.

Since then you have not detected any failure in filtration, or in the quality of the water supply?—None.

Sir *William Crookes*, in answer to Mr. CRIPPS, said he had heard Professor Dewar's evidence, and entirely agreed with it.

Mr. *R. E. Middleton*, in reply to Mr. CRIPPS, said there was no truth in the allegation of the Water Board of the water in the wells being pumped lower than it should be.

Mr. CRIPPS; With regard to the filtering area—about 17 acres—it has been suggested this is not sufficient.

Witness: It must be remembered that the only part of the water which requires filtration is the 22½ million gallons drawn from the Lea. It is a regular quantity, not variable as in other Companies. Seventeen acres is a very large amount for that. The water is excellent; and the filtration is ample.

What do you say about the supply of 31·1 gallons per head?—That is unnecessarily high; and it would be quite possible to reduce it—probably to 26 gallons, with care.

Mr. *Francis*, re-called, gave in detail the various properties contained in the supplemental statement of claim. Most of them had nothing to do with the Company's supply.

In cross-examination by Mr. MOULTON, witness said he could not state whether those not now used for supply had been purchased for water-works purposes or not. The learned Counsel asked various questions in connection with each unused property. Witness denied Counsel's suggestions that they were of any use for the Company's supply, or ever likely to be.

In re-examination, witness said certain of the property could be got rid of without detriment to the water-works.

Mr. MOULTON said he was quite willing that the Court should decide which properties should be regarded as part of the water undertaking, and which should not. He only wanted a division. He submitted that where the pipes went through the land the Water Board must have the land. It was much more convenient to have the freehold than an easement.

Mr. BALFOUR BROWNE said he had no objection, if the Court thought they could do it on the evidence before them.

The PRESIDENT, after a brief consultation, said: We will endeavour to give our decision on these various properties on Thursday morning; but, of course, unless the whole of them are treated as part of the water undertaking, your accounts would require readjusting.

Mr. BALFOUR BROWNE said that would be so.

Mr. *Middleton* was then re-called, and gave further particulars with regard to the works of the Company.

Nineteenth Day—Thursday, Nov. 26.

The PRESIDENT delivered the judgment of the Court with reference to the surplus lands of the New River Company which were to be taken to form part of the undertaking, and in respect to which there is a supplemental claim of £160,000. He said their decision was that the lands numbered 84 to 91 inclusive, Nos. 37 and 38, and Nos. 67 to 70 inclusive, except that part of the land which was contiguous to No. 66 on the southern side, and was divided from the residue by a public road—all these constituted a part of the undertaking, and none of the other lands formed part of the undertaking. There are in all 54 properties; and the result of the decision is that 13 of these were declared part of the undertaking.

Mr. MOULTON: Under the decision of the Court, it is understood that the Clerkenwell Estate comes within the schedule of excepted lands, and does not form part of the undertaking.

The PRESIDENT: Certainly.

Mr. *Middleton*, recalled and examined by Mr. CRIPPS, said he thought there was ample water from the existing resources of the Company up to the year 1907, beyond which date they did not go, although they had tables beyond that. This was, of course, outside the Staines reservoirs or the communication pipe which would bring the Staines reservoirs water. Table Z was a corrected account between the Accountants, with which he had nothing to do. The only sums that he had anything to do with, though his name was at the bottom of the table—the other matters being accountants' business or matters of principle—were the three engineering items of £838, £3139, and £7798. He went on to explain the adjusted items. The average for the ten years in the pumping account was at the rate of £38,283 per annum.

Mr. CRIPPS: What is it in the particular year?

Witness: The corrected figure in Table Z is £43,996.

The difference between this and the average that you get would be £5713?—That is so.

The PRESIDENT: If you take the average of five years for Table Z2—maintenance of mains—why do you not take it for the pumping and engine charges?

Witness: The reason for that is because, in the other one (the mains), if I took ten years I should have to include the year of the great frost, which affected the price greatly. I do not think if this was corrected there would be any difference whether you took ten years or five.

Mr. MOULTON said it would be necessary, on behalf of the Water Board, to call evidence to show that there would be heavy charges incurred for maintenance in the future, more especially with regard to the reservoirs.

Mr. CRIPPS submitted amended tables showing the expenditure of the Company would be at the rate of 39·47 per cent. of the income. Under the decision of the Court with respect to the limit of a 10 per cent. dividend, the amount to be paid would be £210,196 annually; and the capital claim of the Company would be £7,345,495, which would be increased to £8,214,163 by other items, including £116,000 for the redeemed land-tax in perpetuity with regard to the surplus lands. The learned Counsel quoted Acts of Parliament respecting the land-tax as affecting the shareholders of the Company. He contended that they were entitled to the redeemed land-tax in perpetuity, in addition to the 10 per cent.

Mr. MOULTON said it appeared to him that the unredeemed land-tax and the redeemed land-tax were exactly of the same nature. In the one case, the liability, which was a charge on the share of a shareholder, had been redeemed by a particular person who possessed that share; and he presumed that when he sold that share he had passed on the benefit of it to his successor. In the other case, the charge remained on the share, which was paid by the Company. If the Court looked at the Act which imposed this charge, it appeared to be perfectly clear that it was a charge on the real property represented by the shares, and a charge which was affixed to the dividend on the shares. It was a charge which was fixed. The Governor, however, was empowered to pay it for the shareholder; but he had to deduct it from his next dividend. The real point to be decided was whether the limitation to 10 per cent. was to the dividend thus reduced, or to the dividend itself—whether the charge was, as it were, a charge coming on the dividends in the hands of the shareholder, or whether it was a charge against that which gave the dividend so that the shareholder was entitled to receive his full 10 per cent.

The PRESIDENT intimated that the Court would give their decision on the point as soon as possible.

Mr. CRIPPS said the next item was that of the Directors' remuneration, which he urged was not an ordinary matter of Directors' remuneration. The Adventurer's share had been worth more in the market than the King's share. He would take cases in 1898 and 1899. In 1898, an Adventurer's share sold for £125,352. In the same year, as far as they knew, one King's share was transferred, and that sold for £115,500. In 1899, an Adventurer's share was sold for £124,000, and a King's share in the same year for £114,000. In each case there was £10,000 difference. The only difference between the two was that one had a right to what were called Directors' fees—which were not Directors' fees really—and the other had not. They were both entitled to the same proportion of the common profits of the undertaking; but one, in addition, had the right of being a Director upon the Board, with the corresponding advantages. Therefore it appeared from this that the Adventurer's share was worth, roughly, £10,000 more than the other. What they claimed as regarded this Directors' remuneration in perpetuity was, capitalized, about £396,255. Counsel next put forward the claim of £489,342 for back dividends, &c., and certain excess profits, and called evidence.

Mr. *James Searle*, examined by Mr. BAGGALLAY, said he was Clerk to the New River Company, and had been so for more than twenty years. As to the direction, the Governor, Deputy-Governor, Treasurer, and Auditor, all received salaries, and also fees. The Governor received £600 a year; and the other three £250 a year each. The other Directors received £5 for each weekly attendance; and they also received fees, and £2 for extraordinary meetings. The Governor, Deputy-Governor, and Treasurer were required to be appointed by the Charter, and were especially referred to in it. They were all holders of Adventurers' shares. The business occupying the attention of the corporate body had increased enormously in recent years.

Mr. MOULTON: Does the payment come to an exact sum yearly?

Witness: No; not an exact sum. It varies slightly.

It hovers around £10,000?—Yes.

Mr. MOULTON argued that this sum of £10,000 must either be considered as working expenses or it must be a profit. He had no hesitation in claiming for it the position of working expenses. From the evidence given, he could see nothing which distinguished it from a working expense, just like Directors' fees in any other company. The New River Company, like all other companies, was held to possess Directors who were to be compensated for loss of office; and they had a right to go before the Local Government Board and make their claim for compensation. His learned friend, in asking that this £10,000 should be paid to the Company, was claiming it twice over. He submitted that, both in fact and in law, this was a working expenses account.

Mr. FITZGERALD, following on the same side, said they found in the accounts of the Company that they had themselves dealt with it upon the footing that it was one of the management expenses for services rendered—not that it was a profit attached to the share in any shape.

Mr. CRIPPS argued that the amount was not part of the working expenses. The only proportion which was part of the working expenses was that which was really attributable to services rendered.

The Court having retired to consider their decision,

The PRESIDENT asked how many Adventurers' shares there were.

Mr. CRIPPS: Thirty-six.

The PRESIDENT, in delivering judgment, said the question they had to decide in this case was whether or not the sums which had been from time to time paid to such of the Adventurers who acted as Directors of the Company did or did not constitute a working expense of the Company. If they did, they must be deducted before the sum to be divided could be ascertained; if they did not, then they became profits of the Company. The officers received salaries, and, in addition, each Adventurer who attended weekly meetings received the sum of £5, and each one who attended an extraordinary meeting received £2. It must be borne in mind that these payments were for work and labour done; and the officers were very much like the Directors of an ordinary company. The only peculiarity was that the number of Directors in proportion to the shareholders was unusually large. It appeared that there were thirty entire shares, the owners of which were competent to take their seats at the Board. But there were only 29 seats at the Board, and the junior shareholder in some way or other awaited the opportunity to ascend to the Board of Direction. Therefore, the payments made in this way partook to a large extent of the ordinary character of payment for work done. It appeared that the payments were made for superintendence exercised by these 29 gentlemen over the affairs of the Company; and therefore it must be regarded as a working expense. But what was more important was this—that, under the covenant between the original Adventurers and the King, they entered into an obligation that the King's shareholders, and their successors, should for ever receive one-half of the benefits and profits of the Company. The Adventurers were under an obligation of a distinct kind to pay over one moiety of this sum to the King's shareholders if there was a profit; but they had never done anything of the sort, but had deducted it. If the argument now set up before the Court was correct, for a long series of years the Adventurers had been keeping the King's shareholders out of a sum of money equal to £5000 a year, which was their own. He did not think they could attribute any conduct such as that to the Adventurers. The Court would therefore declare that, in their opinion, the sum paid to such of the Adventurers who acted as Directors was one of the working expenses of the Company, and must be deducted from the assets.

Professor *Boyd Dawkins* stated that the difference in the yield of the wells of the Company was due to the rainfall. The idea of the draining by the wells reducing the water level of the Company's watershed was an old one. Over the whole of the area of the Lea, in common with all chalk areas in this country, there was no diminution from pumping at a distance from the point of suction of the well. There was one exception to this in the area under London, where there was a depression which had been going on for many years.

Mr. *Marshall*, rating surveyor and valuer, gave evidence as to acting for the New River Company in their assessment cases. From an investigation of the books of the Company, he had come to the conclusion that they had undercharged for water in the City of London, and in ten boroughs outside, to the extent of £50,413 last year.

LAMBETH WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the Offices, Brixton Hill, under the presidency of the Right Hon. Viscount HAMPDEN, G.C.M.G.

The SECRETARY (Mr. H. Wilkins) having read the notice calling the meeting,

The CHAIRMAN observed that, in view of the abnormal character of last season—a summer of almost continuous rain—he thought that the proprietors would agree that the report and accounts were highly satisfactory. The weather had affected the Company in two ways—it had checked the natural growth of their income, and it had cost them an additional sum for filtration owing to the condition of the river during a considerable portion of the half year. Nevertheless, the rate of dividend was maintained. It was also gratifying to know that although the water as drawn from the river had been in a turbid state, the filtered water as delivered by the Company had been of the usual excellence; and, indeed, the rate of mortality from zymotic and other diseases had been abnormally low throughout the half year. The number of new supplies had been unusually large—larger, in fact, than during any previous half year in the history of the Company since it was established in 1785. They might, therefore, congratulate themselves that they were transferring to the Water Board a business which was not only prosperous now, but which certainly had within itself the seeds of future prosperity. During the past two half years, no fewer than 4366 new supplies had been added to the Company's works, representing a population of between 26,000 and 27,000 persons. Deducting the losses by empty houses, there was a net addition during the year to the population supplied by the Company of 20,000 persons—a fact which spoke for the progressive character of the undertaking. Of the capital expended during the half year, more than half was attributable to the 54-inch main which was being laid between Molesey and Ditton for the conveyance of unfiltered water. The completion of this work had unfortunately been delayed by the rain. The balance of the Company's capital expenditure was made up of various items, mainly to keep the Company's system ahead of its requirements for the day. The salient features of the revenue account were clearly stated in the Directors' report. Perhaps, the only remark he need make on the dividend and interest account was a reference to the fact that only a portion of the contingency fund had been transferred, instead of the whole, as the proprietors decided at the last half-yearly meeting. The fact was that the Government Auditor desired that the accounts might not be complicated at this particular moment by any novel feature; and the Directors readily acceded to this desire. No question of principle was involved in amalgamating the undivided profit of the Company; and any exceptional expenditure would be defrayed from the contingency fund as heretofore. The Engineer's report on the condition of the works spoke for itself. The constant system of supply had been gradually extended, but lately the Directors had held their hands, thinking it desirable to leave their successors free in this matter. With respect to the proposed transfer of the Company's undertaking, he might state that as soon as the Water Board were constituted, the Directors approached them with a suggestion that much trouble, expense, and delay would be saved if the terms of transfer could be arranged by agreement. The case of the Lambeth Company was simple and free from complication; and it seemed probable that the Water Board might prefer to open up negotiations rather than allow the matter to go before the Court of Arbitration without any previous attempt at settlement. A courteous acknowledgment of this suggestion was received, with an intimation that the Directors' letter should have the Board's most careful consideration; but from that day to this no further communication had been received from the Water Board on the subject. Some three or four weeks later, however, Mr. H. L. Cripps, the well-known Parliamentary Agent, wrote that the Directors' letter had been laid before him (a rather curious expression to use), but he feared that until the Water Board had more information than they then possessed, it would be difficult to attempt any negotiation. It might be safely asserted that the concerns of no company or group of companies were so open to the world as those of the London Water Companies. For more than 30 years their accounts had been examined by a Government Auditor, and their operations had been carried on under the supervision of a Water Examiner, also appointed by the Government. For many years, too, their water was examined by Sir Edward Frankland on behalf of the Registrar-General, and since his death by the Chemists of the Inland Revenue Department. Within the last ten or twelve years, the London Water Question had been exhaustively considered by two Royal Commissions, besides forming a repeated subject of inquiry by Parliamentary Committees. All the information thus obtained had become public property. The Directors were, therefore, somewhat surprised that Mr. Cripps should suggest that more information was needed. They nevertheless assured him that they would be happy to hear from him as soon as he had obtained the requisite knowledge and authority to enter upon negotiations. These overtures of the Company were without result. He might almost say that the Water Board did not seem to have dealt seriously with the question; for they actually offered, in answer to the Company's claim, £1,000,000 for an assured income of £160,000 per annum, which would have given them 16 per cent. for their investment. Their offer was an indication of zeal untempered most certainly either by knowledge or discretion. It was, in fact, an emphatic *non possumus* to the idea of purchase by agreement. The consequence was that the Company had been drawn into an arbitration which would be costly to the ratepayers, and which would throw upon the Executive of the Company a very heavy increase of work and responsibility. The Directors had anticipated the desire of the shareholders to recognize this increase of work and responsibility—following, as it did, upon the labour involved in connection with the passing of the Purchase Act through Parliament—by extra remuneration, and

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 536.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	18½—19½	..	5 7 8
100,000	10	,,	7½	Do. 7 p.c.	12½—13½	..	5 11 1
200,000	5	Nov. 12	6½	Bombay, Ltd.	5½—6	..	5 8 4
140,000	5	,,	6½	Do. New, £4 paid	4—4½	..	5 15 7
380,000	Stk.	Aug. 13	12	Brentford Consolidated	230—235	..	5 2 2
300,000	,,	,,	9	Do. New	173—178	..	5 1 1
50,000	,,	,,	5	Do. 5 p.c. Pref.	150—135	..	3 14 1
206,250	,,	June 11	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
220,000	Stk.	Sept. 11	10½	Brighton & Hove Orig.	207—212	..	5 1 5
246,320	,,	,,	7½	Do. A. Ord. Stk.	145—150	..	5 3 4
460,000	20	Oct. 15	10	British	38½—39½	..	5 1 3
100,000	Stk.	Aug. 13	6	Bromley, Ord. 5 p.c.	115—120	..	5 0 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	88—93	..	4 16 9
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd.	101—102	..	6 10 3
250,000	Stk.	June 26	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	July 10	8½	Cagliari, Ltd.	23—24	..	6 17 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14½—15½	..	6 9 0
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
1,375,000	Stk.	Aug. 27	5 5/16	Commercial 4 p.c. Stk.	104—107	—1	4 17 3
503,750	,,	,,	5	Do. 3 p.c. do.	97—100	—2	5 0 0
442,947	,,	June 11	3	Do. 3 p.c. Deb. do.	87—90	..	3 6 8
800,000	Stk.	June 11	7	Continental Union, Ltd.	118—123	..	5 13 10
200,000	,,	,,	7	Do. 7 p.c. Pref.	130—135	..	5 3 8
575,000	Stk.	Aug. 27	5½	Crystal Palace Ord. 5 p.c.	112—117	..	4 11 1
60,000	,,	,,	5	Do. 5 p.c. Pref.	118—123	..	4 1 4
112,533	,,	July 10	5	Do. 5 p.c. Deb. Stk.	135—138	..	3 12 6
486,090	10	July 29	10½	European, Ltd.	18—19	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14	..	5 12 6
15,243,200	Stk.	Aug. 13	4 5/16	Gas-light and Coke	4 p.c. Ord.	88—90	+3	4 17 9
2,600,000	,,	,,	3½		3½ p.c. max.	86—88	..	3 19 7
3,799,735	,,	,,	4		4 p.c. Con. Pref.	107—110	+1	3 12 9
4,193,473	,,	June 11	3		3 p.c. Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Sept. 11	5	Hastings & St. L. 3½ p.c.		90—95	..	5 5 3
70,000	10	Oct. 15	8	Hongkong & China, Ltd.		16—17	+1	4 14 2
3,800,000	Stk.	Nov. 12	10	Imperial Continental		200—203	+1	4 18 6
473,600	Stk.	Aug. 13	3½	Do. 3½ p.c. Deb. Red.		98—100	—1½	3 10 0
165,242	Stk.	Aug. 27	6	Lea Bridge Ord. 5 p.c.		113—118	..	5 1 8
561,000	Stk.	,,	10	Liverpool United A		213—215	..	4 13 0
718,100	,,	,,	7	Do. do. B		163—165	..	4 4 10
306,083	,,	June 26	4	Do. do. Deb. Stk.		110—112	..	3 11 5
75,000	5	June 11	5	Malta & Medn., Ltd.		4½—4⅝	..	5 5 3
560,000	100	Oct. 1	5	Met. of	5 p.c. Deb.	101—105	..	4 15 3
250,000	100	,,	4½	Melbourne	4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 12	3½	Monte Video, Ltd.		9—10	..	7 0 0
1,515,892	Stk.	Aug. 13	4½	Newc'tle & G'tesh'd Con.		106—107	+1	4 4 1
376,855	Stk.	July 3	3½	Do. 3½ p.c. Deb.		96—97	..	3 12 2
300,000	Stk.	Nov. 26	8	Oriental, Ltd.		135—140*	..	5 14 4
600,000	5	Sept. 30	7	Ottoman, Ltd.		5⅜—6⅝	..	5 7 8
205,005	Stk.	June 26	6⅛	Ply'mth & St'house 5 p.c		123—128	..	4 15 8
851,070	10	Oct. 15	7	River Plate Ord.		10⅞—11	—⅛	6 7 3
300,000	Stk.	June 26	4	Do. 4 p.c. Deb.		94—96	..	4 3 4
250,000	10	Sept. 30	8	San Paulo, Ltd.		10½—11½	..	6 19 2
135,000	Stk.	Sept. 11	10	Sheffield A		239—241	..	4 3 0
209,984	,,	,,	10	Do. B		239—241	..	4 3 0
523,498	,,	,,	10	Do. C		239—241	..	4 3 0
116,106	Stk.	Sept. 30	5	Shrewsbury Ord. 5 p.c.		103—112	..	4 9 3
6,150,000	Stk.	Aug. 13	5⅛	South Met., 4 p.c. Ord.		119—122	+1	4 7 4
1,780,000	,,	July 10	3	Do. 3 p.c. Deb.		87—90	..	3 6 8
380,940	Stk.	Nov. 12	5	Southampton Ord.		104—108	..	4 12 7
87,950	,,	July 10	4	Do. 4 p.c. Deb.		102—105	..	3 16 2
120,000	Stk.	Aug. 27	6	Tottenham and Edmonton	A. 5 p.c.	115—120	..	5 0 0
313,020	,,	,,	4½		B. 3½ p.c.	95—100	..	4 10 0
182,380	10	June 11	8	Tuscan, Ltd.		8—9	..	8 17 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.		98—100	..	5 0 0
737,142	Stk.	Aug. 13	5	West Ham, 5 p.c. Ord.		93—98	..	5 2 0
				WATER COMPANIES.			
780,776	Stk.	June 26	11⅛	Chelsea, Ord.		300—310	..	3 14 2
150,000	,,	,,	5	Do. 5 p.c. Pref.		140—145	—4	3 9 0
160,000	,,	,,	4⅜	Do. 4½ p.c. Pref. '75		131—136	—1	3 6 2
175,785	,,	Sept. 30	4⅜	Do. 4½ p.c. Deb.		152—137	—3	3 5 8
1,720,560	Stk.	Oct. 15	8	East London, Ord.		205—215	..	3 14 5
654,740	,,	June 11	4⅜	Do. 4½ p.c. Deb.		138—143	..	3 2 11
1,282,943	,,	,,	3	Do. 3 p.c. Deb.		90—94	—1½	3 3 10
700,000	50	June 11	10	Grand Junction	10 p.c. max.	120—125	..	4 0 0
310,000	Stk.	Sept. 30	4		4 p.c. Deb.	120—125	..	3 4 0
708,000	Stk.	Aug. 13	10	Kent		270—280	—5	3 11 5
160,000	,,	,,	7	Do. New, 7 p.c. max.		185—195	..	3 11 10
1,043,800	100	June 26	11	Lambeth, 10 p.c. max.		285—295	..	3 14 7
406,200	100	,,	8½	Do. 7½ p.c. max.		205—215	..	3 19 1
350,000	Stk.	Sept. 30	4	Do. 4 p.c. Deb.		120—125	..	3 4 0
500,000	100	Aug. 13	12 5/16	New River, New Shares		330—350	—40	3 13 1
1,000,000	Stk.	July 29	4	Do. 4 p.c. Deb.		120—123	..	3 5 1
902,300	Stk.	June 11	7½	South-wark and	Ord.	225—235	+2½	3 3 10
126,500	100	,,	7½		7½ p.c. max.	200—210	..	3 11 5
489,200	Stk.	,,	5		5 p.c. Pref.	140—145	—3	3 9 0
1,019,585	,,	Oct. 15	4	Vauxhall	4 p.c. A Deb.	118—123	..	3 5 1
1,155,066	Stk.	June 11	10	West Middlesex		280—285	—2½	3 10 2
200,000	,,	,,	4½	Do. 4½ p.c. Deb.		132—137	—1	3 5 8
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb.		89—92	—3	3 5 3

* Ex div.

were asking for a sum of £7350 for this purpose. He might also mention that during the last few years extensive additions had been made to the works of the Company, to meet present and prospective requirements; and as the Engineers were paid inclusive salaries, they did not reap the pecuniary advantages which payment by commission would have given them. This was a grant which, if given at all, should be given cordially; and it was in this spirit that the Board recommended it. Without committing the Directors to any definite allocation, he might say that the staff would include the Secretary, the Engineers of the Company, the Board, and the Legal Advisers. It was really unnecessary to dwell upon the increase of work and responsibility entailed on the Executive of the Company. He concluded by moving the adoption of the report.

Mr. G. E. N. RYAN seconded the motion.

Mr. WHEATSTONE, alluding to the proposal to place £7350 at the disposal of the Board to remunerate the Executive, inquired whether it was not the fact that in all such arbitrations as that which was now going on in connection with the transfer of the water undertakings, the officials and Directors received some compensation for their loss of office.

The CHAIRMAN replied that the £7350 in question was not for loss of office, but for extra work done by the Executive in connection with the transfer of the undertaking, &c. Loss of office was an entirely different matter.

Mr. WHEATSTONE thought that the remuneration which the Executive would receive from the Arbitrators would compensate them for anything they had done or were likely to do.

The CHAIRMAN observed that this was a different point altogether from that contemplated by the Directors' proposal. As, however, he had already said, the grant, if given at all, should be given cordially, and in this spirit the Directors recommended it. The hon. proprietor had expressed his view in an opposite sense; and if this were the general feeling of the meeting, the Board would not be prepared to press the matter.

Rev. H. GARDINER said that, in his opinion, the affairs of the Company had been managed so well that the proprietors ought not to dissent from such a proposal as that in question.

The motion was carried with one dissentient.

The CHAIRMAN then proposed the payment of dividends at the prescribed rates on the 10 and 7½ per cent. stocks, together with a payment at the rate of 1 per cent. per annum on both descriptions of stock on account of deficiencies of previous dividends.

Mr. WILLIAM J. FRASER seconded the proposition, which was carried unanimously.

The CHAIRMAN then proposed a resolution placing at the disposal of the Board the £7350 referred to, "in accordance with the recommendation contained in the concluding paragraph of the foregoing report."

Rev. H. GARDINER seconded the motion, which was carried with one dissentient—Mr. Wheatstone.

The meeting then terminated.

METROPOLITAN WATER BOARD.

Settlement of Claims—Management of the Undertakings.

A Meeting of the Board was held on Friday, at the Offices of the Metropolitan Asylums Board—Mr. R. M. BEACHCROFT presiding.

The Special Arbitration Committee submitted an adjourned report, dated Oct. 12, in which they stated that at the last meeting of the Board they reported that they were in negotiation with the Councils of the urban districts of Tottenham and Enfield with a view to arriving, if possible, at an agreement with these authorities as to the amount to be paid by the Board in consideration of the transfer of their respective undertakings. They now had to report that agreements had been arrived at and provisionally approved by the Board and the Councils concerned. The amounts of the respective claims were as follows: Tottenham, £103,452; Enfield, £121,000. They now recommended: (*a*) That the Board should agree to pay the Tottenham Council the sum of £77,750, to include all costs, charges, and expenses, and further such capital expenditure not exceeding £1400 as might be properly incurred by the Council between March 31, 1903, and the date of the agreement; (*b*) that the Board should agree to pay to the Enfield Council the sum of £66,000, to include all costs, charges, and expenses, and further such capital expenditure not exceeding £7500 as might be properly incurred by the Council between March 31, 1903, and the date of the agreement; and (*c*) that the Solicitors should be instructed to take all steps requisite to give effect to these resolutions.

The first two resolutions were carried by 35 votes to 9; and the last was agreed to.

In a report presented by the General Purposes Committee, they brought forward a scheme for the appointment of such Committees as might appear desirable with a view to the management of the undertakings of the Board. Certain information had been obtained from water companies and local authorities as to the system adopted by them; and this had been placed before the Committee by the Clerk to the Board. Having dealt with this, the Committee expressed the opinion that the Board should adopt the guiding principle that all the undertakings must be brought under central control, and be administered as one united whole; and they believed that such a purpose could best be achieved by dividing the business of all the undertakings into appropriate classes, and co-ordinating the common classes of the whole and entrusting each co-ordinated class to an appropriate Committee established for the purpose, thereby securing for each class of business uniform treatment throughout at the hands of one Committee appointed to look after that particular division of the business of the Board. After dealing with the details of the scheme, the Committee made, among others, the following recommendations: That a Works Committee should be appointed to consider all questions incident to the provision and maintenance of sources of supply and the management of the works generally; that a Rates and Appeal Committee should be appointed to consider all questions relating to appeals against

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W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

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	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	ACCRINGTON	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Fourth Contract)	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
MONTREAL, ONT. (Second Contract) . . . . . 1,800,000 Cub. Ft.

water-charges, a scheme for the collection of water-charges with the rates of the local authorities, or separately, as might be determined, and the assessment of the property of the Board to Imperial and local rates, taxes, and the like; that the Finance Committee should be reconstituted, and, in addition to the powers and duties prescribed by its present reference, should superintend the collection of the water-charges; and that the Law and Parliamentary and General Purposes Committees should be reconstituted.

With the exception of the recommodation as to the appointment of a Rates and Appeal Committee, which was struck out, all the recommendations in the report were adopted, with certain amendments.

It was then resolved to invite applications for the position of Accountant to the Board, at a commencing salary of £1000 per annum.

Mr. PICKERSGILL moved the following resolution: "That it be referred to the General Purposes Committee, in consultation with the Law and Parliamentary Committee, to frame and bring up as soon as possible general clauses respecting wages, hours, and conditions of labour and sub-contracting, suitable for insertion in contracts for the supply of goods or services to which the Board may be a party."

Colonel COLVILE moved, as an amendment, that the words "to consider and report as to the desirability of framing" should be substituted for the words "to frame and bring up as soon as possible."

This was carried; and the resolution, as amended, was adopted.

The Board then adjourned.

FAILURES OF THE ELECTRIC LIGHT.

"For the first time in the history of the York Corporation's electric light undertaking," the supply totally failed last Tuesday. Of course, this happened at a particularly busy time—one of the Martinmas fair nights; and it is reported that the tradespeople who had not taken the precaution of keeping their gas-fittings suffered materially. By way of consoling the consumers, a local paper remarks that "there are very few towns which have not experienced a failure in their electric supply; and the wonder is, not that the York service failed last night [Tuesday], but that it has not broken down before." The explanation is that, owing to the increased demand for current, the works are continuously kept going at high pressure; but when the extensions are completed, "there will be no reason to apprehend a breakdown." In view, however, of last week's accident, and of the fact that "there are very few towns which have not experienced a failure in their electric supply," the shopkeepers will probably hesitate to put themselves again entirely at the mercy of the electric light undertaking.

By a curious mischance, a failure of the electric light occurred the same day at Nottingham. Work was proceeding in the usual way at the Guildhall, when it was suddenly brought to a stop by the extinction of the lights—giving rise, as may be readily supposed, to no end of confusion. Fortunately, all the gas-jets were not removed when the new system of lighting was installed in the building; and the few remaining were immediately brought into use. As closing time was approaching in the clerical department, the loss of light did not interfere greatly with the progress of business. In the police offices, however, the effects of the occurrence were keenly felt. The accident arose through the giving way of a main fuse, which was burnt out, from some cause which the officials in the Electricity Department could not explain, as there had been no overloading. However, the damage was repaired in rather more than an hour.

READING AND ELECTRIC LIGHTING MISHAPS.

The Reading Corporation should profit before it is too late by the abundance of evidence that is coming to them as to the unreliability of the electric light. At the last meeting of the Watford District Council, there was both amusement and concern over a little mishap at the electric light works that had occasioned a great deal of inconvenience. That is the way of the electric light to be terribly affected by some insignificant matter. Complaint was made as to the poorness of the light, and candles were asked for. While the business was proceeding, some wag sent a parcel marked "most urgent." On investigation, it was found to contain 2 or 3 lbs. of candles, and a note, signed "Long Sufferer," expressing "the compliments of one of the users of the electric light." Upon an injured boiler tube the blame was laid for the present deficiency; but the boiler tube in question cannot be expected to take the whole blame for the causes which (as one member put it) have made the people "sick of this sort of thing." Then it transpired that all three boilers at the electric lighting works were in use; but "the draught was very bad." Some of the members laughed—the laugh of men who feel they are being befooled by the character of the excuses advanced. Complaint was also made as to the streets being in darkness; and this is explained to be due to the fact that the lamps had been extinguished "in order to give a greater pressure to the private consumers." There were many uncomplimentary remarks made after this with reference to electric lighting. At Maidenhead, the residents near an electric lamp have been having a little fun. The lamp had been indulging in what has been described, in a local paper, as "a series of gymnastics;" and so dismal was the performance that one of the residents suspended a stable lantern containing a candle on the column. But this good turn was rewarded by someone purloining the article in question. One of the Reading papers calls attention to these amusing incidents and to the decision of the Court of Common Council of the City regarding incandescent gas lighting. Upon them, it is remarked: "If there should be any doubt as to the superiority and cheapness of incandescent gas over electric light for street lighting purposes, that doubt should be dispelled by the volume of evidence that is constantly being added to."

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PUBLIC LIGHTING OF BIRMINGHAM.

The Public Works Committee of the Birmingham Corporation have adopted a scheme for the improvement of the lighting of the city and suburbs, though even now, according to a report on the subject prepared by the City Surveyor (Mr. John Price), Birmingham is well abreast of the times in this matter. Of towns having a population of over 200,000, only three—Glasgow, Bradford, and Liverpool—appear to have their streets better lighted than is the case in Birmingham. In the returns as furnished by Mr. Price, there is only one place in which the authorities differentiate between the suburbs and the centre of the town; and this is Liverpool, where the lamps are lighted in the central portion for 3808 hours per annum, and the suburbs for 3577 hours. Hitherto, in Birmingham, the central portion has been lit for 3700 hours per annum by 4277 street lamps and 1847 court lamps; while in the suburbs 5524 street lamps and 1869 court lamps have been lit for 3575 hours per annum—125 hours less than those in the centre of the city. The reason for this difference, it is said, has been that twilight does not fall quite so quickly in the suburbs, where the smoke in the atmosphere is less than in the central portion. The Committee have now decided to light all the lamps, both in the city and in the suburbs, for 3738 hours per annum, which is equal to an additional 38 hours in the centre and 163 in the suburbs. At present, the number of lamps in the public streets of Birmingham—as distinct from courts—is, as already mentioned, 9801, of which 4984 are fitted with incandescent burners. Under the new scheme, the incandescent lamps will be increased by 1185, at a cost of £630. Some 371 of these additional incandescent burners have been fitted; and the remainder are to be installed as quickly as possible. The new table of lighting hours has already been put in operation, and when the new scheme is completed, all the thoroughfares in the city of any importance will be lighted with incandescent lamps.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Some speculation is being indulged in as to the filling up by the Glasgow Corporation of the posts of Manager of their various gas-works which have become vacant of late. I am able to state that nothing has as yet been decided upon; but that the Sub-Committee on Works have appointed a Special Sub-Committee, consisting of seven members, "to consider and report as to the appointment of Station Managers for the Dawsholm, Tradeston, and Provan Gas-Works, and an Assistant General Manager." The concluding clause of the remit indicates a change of some importance; but a change which it is surprising was not made long ago, considering the magnitude of the undertaking. I may mention here that Mr. R. M. Mitchell has been re-elected Convenor of the Committee on Gas Supply.

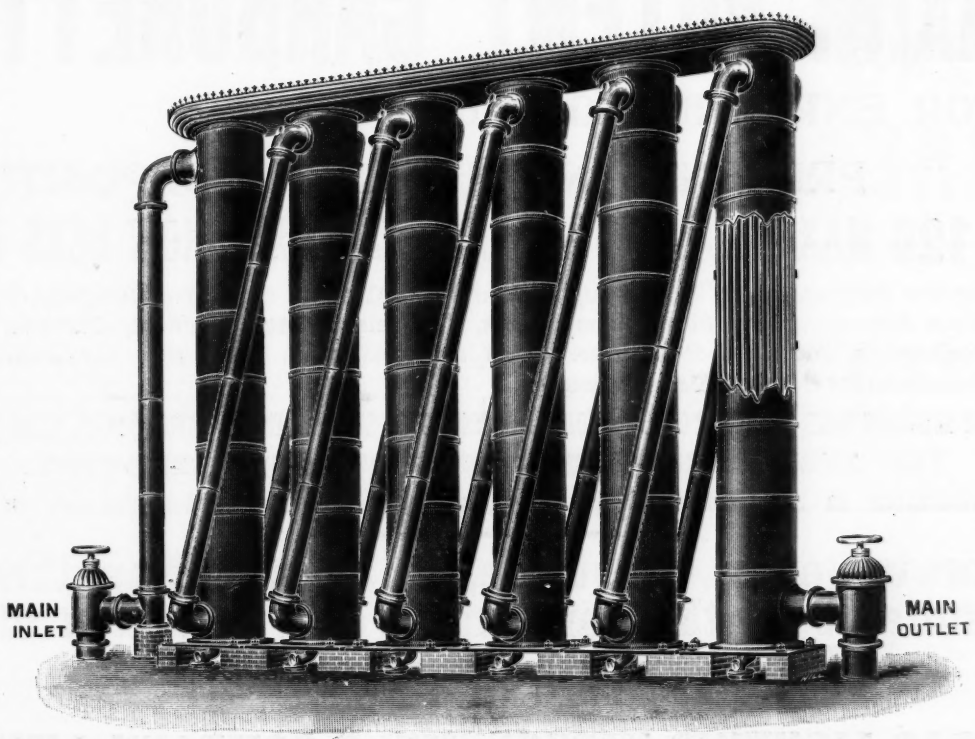
The Corporation of Glasgow have, after an exhaustive system of inquiry, resolved, by 33 votes to 27, to construct a conduit in Nelson Street, which was brought before the Town Council several months ago by the Statute Labour Committee. The proposal was to construct an experimental and well-ventilated conduit for the reception of all service-pipes, cables, or wires required for public or private purposes, including those of the gas, electricity, and water departments of the Corporation, as also those of the Post Office, and any other service-pipes, cables, or wires that the Corporation might agree to receive; the terms of contribution for the construction and maintenance of which by the various departments interested to be afterwards arranged. It will be observed that the proposal is only an experiment; and before it is carried into effect, the terms of contribution have to be fixed.

Some time ago, an ice-cream dealer in Blairgowrie granted a trust-deed for behoof of his creditors in favour of Mr. W. F. M'Alpine, Solicitor, of Blairgowrie. There was at the time an outstanding account for gas due to the Blairgowrie Gaslight Company. In order to enable him to dispose of the business as a going concern, Mr. M'Alpine deposited £1 with the Company, which they accepted for the purpose for which it was offered. The time for the expiry of the deposit drawing near, the Gas Company presented their original account, and threatened that, unless it were paid, the gas would be cut off from the premises. Mr. M'Alpine paid the account under protest. Thereafter he raised an action in the Sheriff Court at Perth, in which he asked for an order on the Company to return to him the amount of the account, which, he said, he had paid under threat. The Company said that they declined to accept payment under protest, and granted an ordinary receipt; and they maintained that the payment was a voluntary one, and that they were not bound to accept a composition upon the debt due to them. Sheriff-Substitute Sym has repelled this plea, and ordered repayment of the amount of the account, under reservation of any claim which the Company may have to a preference.

On Monday evening, Dr. Hugh Marshall, of Edinburgh, read a paper before the Royal Scottish Society of Arts on "Improvements Relating to the Use of Carburetted Air for Lighting and other Purposes." The communication had reference to an adaptation of the Notkin process of producing a heavy gas for illuminating and other purposes by the filtration of oil through porous material. Dr. Marshall described an improved block for the filtration, which, instead of being made of paper pulp, had for its base plaster of Paris, with numerous fine channels. Such blocks, he said, had proved excellent for the purpose, owing to their durability and high porosity, and to the ease with which carburation took place by means of them. Lamps in which the gas reached the burner by the force of gravity were exhibited; but, Dr. Marshall said, a new form of lamp had been produced, in which a current of air through the carburettor was produced by the lamp itself, which enabled it to be placed above the carburettor. He had invented a tube for use with incandescent lighting in such a lamp.

CONDENSERS.

WATER COOLING.



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By means of this tube, the mixture of gas and air could be regulated by merely turning the tube the one way or the other. The process was a suitable one for the illumination of country houses. In the case of a local hospital, even the travelling ambulance was lighted by the gas; and the vehicle also carried a food-heating apparatus. Five stations on the North-Eastern Railway Company's system had been for a long time lighted by the gas; and the Notkin Company had received an order from the Government for lighting on the Imperial Railways in South Africa. A large number of experiments were shown in the course of the evening, to illustrate the ease and safety with which the gas can be handled. Dr. Marshall was heartily congratulated on the results he had achieved, and on the success of his experiments.

I mentioned in the "JOURNAL" for November 17 (p. 432) that an action had been brought in the Court of Session in which complaint is made of a gas-engine as a nuisance. A similar action has been in dependence in the Sheriff Court at Dumfries for some time, and has now been decided by Sheriff-Substitute Campion. The complainer, William Maxwell Turner, sought interdict, as against James Wyllie, of the use of a gas-engine which the latter employs for the driving of milling machinery. The noise produced, it was said, was a source of annoyance to the pursuer and to the inmates of his house and premises, and the vibration was injurious to his property. The defender said the premises he occupied had been used for many years for a purpose similar to that to which he applies them. The engine—a Crossley—was made for him, and runs without noise. The machinery, he further said, is only worked between eight o'clock in the morning and six o'clock at night. Sheriff Campion heard evidence in the case; and he has now refused interdict, and found the complainer liable in expenses. He says that the law on the question of nuisances has, in many an authoritative judgment, been very clearly defined. In the case of *St. Helens Smelting Company v. Tipping*, it was laid down in the House of Lords that "if a man lives in a town, it is necessary that he should subject himself to the consequences of those operations of trade which may be carried on in his immediate locality, which are actually necessary for trade and commerce, and also for the enjoyment of property, and for the benefit of the inhabitants of the town and of the public at large. The complainer's premises were situated at a part of the Whitesands, which, if not a locality wholly dedicated to trade and industrial purposes, was certainly a recognized centre of trade in Dumfries. Most assuredly would it be necessary for the complainer to make out a strong case before any Court would feel justified in granting an Order which should hamper or restrict any trade or industry carried on in a locality which was described by Dean of Guild M'Lachlan as certainly a business locality and not a residential district. From the whole evidence, he concluded that the respondent's engine and machinery made a certain dull, throbbing sound, which might possibly be irritating and annoying to one on the constant look-out for noise and vibration; but any annoyance and discomfort thus caused would be more sentimental and trivial than material to a person of ordinary health and nervous temperament.

The consumption of gas in St. Andrews having increased greatly of late, the Gas Company have found it necessary to have a new holder erected. It is of 100,000 cubic feet capacity, which may be doubled when necessary. The Contractors were Messrs. Hanna, Donald, and Wilson, of Paisley.

An explosion of gas occurred in a street in St. George's Road, Glasgow, on Wednesday, by which two workmen in the employment of the Corporation Telephone Department received burning injuries. They had opened a manhole, and one of them struck a match in order to examine the state of the wires, when the explosion occurred. Both men were taken to the Western Infirmary, but were able to go home after treatment.

On Wednesday, the ceremony took place of inaugurating a set of six filters that complete the water-supply system which has been introduced into Bo'ness, at a cost of £45,000. The filters are capable of dealing with a million gallons of water per day. The present consumption is 750,000 gallons. The Corporation now possess a supply which is not only sufficient for themselves, but which enables them to sell water to the Burgh of Linlithgow and other local authorities which are not so well circumstanced as themselves.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 28.

Sulphate of Ammonia.

There has been better demand, and in some cases an advance on last week's figures has been paid for immediate delivery; but at the close the market is quieter, and the quotations are £12 per ton f.o b. Hull, £12 1s. 3d. per ton f.o.b. Liverpool, and £12 2s. 6d. per ton f.o.b. Leith. The attitude of makers and direct buyers remains as last reported in regard to delivery ahead. Makers require £12 10s. to £12 12s. 6d. per ton f.o.b. for delivery up to June, while buyers are endeavouring to get in at a moderate premium for the near months, leaving the later months to take care of themselves.

Nitrate of Soda.

This is steady at 9s. 6d. per cwt. for ordinary, and 10s. for refined quality, on spot.

LONDON, *Nov.* 28.

Tar Products.

The markets, as a rule, remain quiet; but prices are fairly well maintained, with the exception of pitch, which is decidedly dull, and quotations have a downward tendency. During the past week, there have been several inquiries for forward delivery, which, however, have not resulted in business. Dealers are evidently offering at very speculative prices, which prevents consumers from purchasing. It seems, however, that several makers are getting anxious as regards

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next year; and, unless some improvement takes place, lower prices must rule for forward delivery. The market for benzol continues firm; and there is a good demand, especially for 90 per cent. 50-90 per cent. is not particularly inquired for. A little business was done for home consumption at 8d. for forward delivery; but consumers seem indifferent to this quality. Toluol is again rather quiet; but, as there is nothing offering, prices remain nominal. In crude carbolic, a large business has recently been done at 1s. 6d. for November-January delivery; while some country makers report sales at 1s. 6½d. for January-June. Crystals, however, are dull, and there is not much inquiry. The demand for creosote is still very good for both export and home consumption. So far as London is concerned, makers are unable to deliver promptly, and are not at all anxious to sell for forward delivery. In the North, there is very little offering, while the demand continues exceptionally good for the time of year. In solvent, prices are fairly well maintained. Evidently stocks have been largely reduced during the past month. In anthracene, there is nothing fresh to advise. Both makers and consumers appear to be indifferent as to the future of the article.

The average values during the week were: Tar, 23s. 6d. to 28s. 6d. Pitch, London, 45s. to 45s. 6d.; east coast, 44s. 6d. to 45s.; west coast, 44s. to 44s. 6d. Benzol, 90 per cent., 10⅜d. to 11¼d.; 50-90 per cent., 8d. Toluol, 7½d. to 7¾d. Crude naphtha, 3½d.; solvent naphtha, 9d. to 9½d.; heavy naphtha, 10⅝d. to 11½d. Creosote, London, 1⅞d. to 1 15/16d.; North, 1⅜d. to 1½d. Heavy oils, 2¼d. to 2⅜d. Carbolic acid, 60 per cent., 1s. 6d. to 1s. 6¼d. Refined naphthalene, £5 to £8. Salts, 24s. to 25s. 6d. Anthracene, "A" quality, 1⅜d. to 1⅝d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market closes fairly steady; but for prompt delivery, there is not so much demand. Beckton still quote £12 6s. 3d. for prompt, and are not anxious to sell forward. The South Metropolitan Company have nothing to spare for December, and are asking £12 12s. 6d. for January-June, which price consumers will not at present pay. In Hull, a good business has been doing at £12 for December shipment; but there is nothing to report forward, consumers declining to pay the prices asked by makers. In Leith, the nominal price is £12 for prompt; but there does not appear to be any business doing. For forward delivery, makers are firm in their ideas at £12 10s., and are not anxious to sell even at this price. There has not been very much business during the past week; and it is probable there will not be much alteration in the market for prompt during the present year.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The matter which has engaged perhaps most attention during the past week is the conditional agreement come to between the Federated Coal Owners and the Miners Federation for a continuance of the Conciliation Board and the settlement of the wages question by mutual concessions on both sides. No little apprehension for some time past has prevailed as to the possibility of a break up of the Conciliation Board, and the risk of a strike over the reduction in wages demanded by the coal owners. Happily the risk of serious trouble in this direction has been averted; and the continuation of the Coal Conciliation Board will give another period of settled trade conditions, so far as wages and labour questions are concerned. As to actual trade, there is still little or no real improvement to report. House-fire requirements remain much below the average for the time of the year; and it is quite exceptional where collieries are putting in full time—four to four-and-a-half days being about the average. Prices are about steady at late rates, with no probability of the close of the month bringing about any upward move. Quotations still average about 13s. 6d. to 14s. 6d. per ton for best Wigan Arley, 11s. and 11s. 6d. to 12s. 6d. for seconds Arley and Pemberton four feet, and 9s. 6d. to 10s. 6d. for common house-fire coals. The lower descriptions of round coal also continue in moderate request, common sorts of steam and forge coals not averaging more than 7s. 9d. to 8s. 3d. per ton at the pit, with better sorts quoted 8s. 6d. to 8s. 9d. A fairly active demand is reported for engine fuel. Prices, taking them all through, are perhaps showing rather more firmness, particularly as regards the better descriptions, with not quite so much pushing at low-cut figures in the commoner sorts. Best Lancashire slack is quoted about 5s. 9d. to 6s. 3d. per ton at the pit for steam purposes, and 6s. 6d. to 6s. 9d. for gas-making purposes, medium slack 5s. to 5s. 6d., and common sorts 4s. to 4s. 6d. The shipping demand is only indifferent; but prices are not quite so low as they have been—8s. 9d. to 9s. 3d. being about minimum figures, with good steam coal quoted from 9s. 9d. to 10s. delivered at the ports on the Mersey.

Northern Coal Trade.

There is a fair, though barely a full, demand for coal. In steam coals, best Northumbrian kinds are about 9s. 9d. per ton f.o.b., second-class steams are 8s. 3d. to 8s. 6d., and steam smalls 4s. 3d. to 4s. 6d.—the collieries being fairly well occupied, though losing a day occasionally for lack of ready orders. The best classes are taken up most readily. In the gas coal trade, there is now a full demand, and the deliveries are at the highest point of the season. They are being well met, with an output that seems to be adequate, though there are one or two pits that are not yet fully at work after accidents. For the best gas coals, the price is from 8s. 6d. to 9s. per ton f.o.b. for occasional supplies; while second-class descriptions are rather quiet at corresponding rates. There are no contracts of any moment to report at present. Gas coke is in very full production, and some of the works inland seem to have large stocks on hand; so that the prices are irregular. On Tyneside, about 14s. to 14s. 6d. f.o.b. are the quoted rates for good descriptions.

Scotch Coal Trade.

Trade is steady and full, shipping being particularly busy. New orders are not so numerous as are desired, and, consequently, prices are not improving. The quotations are: Main 7s. 9d. to 8s. per ton

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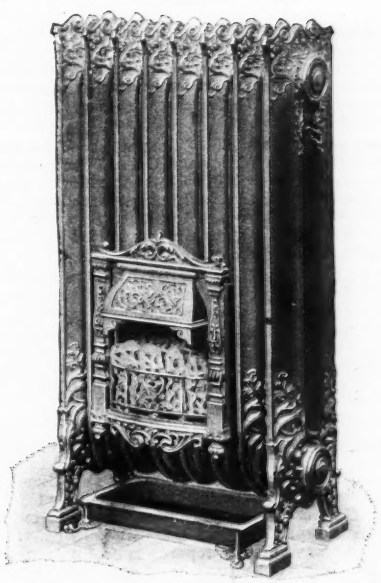

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f.o.b. Glasgow, ell 8s. 6d. to 9s. 6d., and splint 8s. 9d. to 9s. The shipments for the week amounted to 246,109 tons—an increase of 444 tons upon the previous week, and of 1069 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,083,901 tons—an increase of 153,210 tons upon the same period of last year.

Next Year's Coal Prices.

On this subject, the "Pall Mall Gazette," in their "City Notes" column, made the following remarks last Thursday: "Several indications seem to point to lower prices for coal, both for home consumption and foreign shipment, in 1904. Away back in September, large quantities of 'New Hetton' and 'Holmside' were sold at 8s. 6d. per ton f.o.b. Tyne, *ex* tax—a drop of 6d. per ton. Foreign contracts are now being placed for bunker coals for the coming year; the results so far being satisfactory to buyers. Particularly is this so in the case of the Azores; the quotation running between 22s. 6d. and 24s per ton, according to the port. This marks a reduction of 2s. per ton as compared with 1903 rates. Prices for South America show but very slight variation, if, indeed, any; but, nevertheless, the feeling of the market is not so confident as hitherto. Between now and the end of December, large contracts for the Mediterranean must be placed; and prices in this case will prove exceptionally interesting as an indication of the trend of the market."

Gas Supply Failures.—Through an accident at the gas-works, the supply of gas to the town of Watton was recently cut off for some days. A failure also occurred at Penistone, the cause of which is not explained, on a Saturday evening, just when the tradesmen were expecting to do the best of their business. In this case, however, the trouble was at an end by the following Monday.

Amalgamation of Tube-Making Companies.—At a special meeting of the shareholders of the Wilson and Union Tube Company, Limited, held in Glasgow on Monday last week, to consider a proposal to amalgamate with Stewarts and Lloyds, Limited, a motion to confirm a provisional agreement, under which the latter firm obtain a controlling influence on the Board of the former, was carried by 8505 votes against 6239 for an amendment to the contrary.

Fatality at the Wakefield Gas-Works.—An inquest was held at Wakefield last Wednesday week on the body of Thomas Smith, aged 65, who was a labourer at the gas-works. It appeared from the evidence that deceased was working in the retort-house, and while raising a plank by means of ropes his right foot slipped off an iron girder, and he fell a distance of about 15 feet, fracturing his neck. He was at once taken off to the hospital, but died on the way. A verdict of "Accidentally killed" was returned.

Gosport Water Supply.—A private meeting of the Gosport Water Company was held last week, when, owing to the enormous outlay which the establishment of a new source of supply in the Meon Valley would entail, it was resolved to approach the Portsmouth Water Company with a view to obtaining the necessary water from them. The question was raised at the half-yearly meeting of the latter Company; but the Chairman replied that the proposition had not been received, though the Directors would be prepared to give it every consideration. Meanwhile, the Gosport Company are doing their best to remove the saline matter from the water they are supplying from Foxbury, and are going to Parliament for further powers.

Increased Storage for the Gorleston and Southtown Gas Company.—Last Tuesday, Mr. W. Palgrave Brown, as Chairman and Managing-Director of the Company, formally brought into operation the new holder which has been erected for them. It has been built upon a foundation of 1044 tons of concrete, laid on a series of 144 piles, the driving of which was rendered necessary owing to the brackish soil and black ooze forming the land on which it has been constructed. The dimensions of the tank and holder are 50 feet high and 105 feet in diameter. The weight to be borne by the piles beneath the foundation represents 7410 tons. The whole of the foundation work was constructed by the Company's men, and the steel structure by Messrs. C. & W. Walker, Limited, of Donnington; the carrying out of the entire undertaking being supervised by Mr. John Witten, the Company's Engineer and Manager.

Belper and the Ilkeston and Heanor Water Board.—The Belper Rural District Council having given notice to the Ilkeston and Heanor Water Board of their intention to exercise their rights under the Board's Act of 1901 to take water from the Board's mains for the purpose of supplying the districts of Smalley, Smalley Common and Horsley, Horsley Woodhouse, Kilburn, Coxbench, and Denby, a meeting of the parties has been held. After some discussion, a friendly arrangement was arrived at by which the Council are to take their requirements from the Board's mains at Red Lion Square, Heanor; the Council to provide their own mains to deliver the water into a reservoir to be situate on the highest point at Smalley. Great satisfaction was expressed on both sides that terms had been agreed to, without referring the matter to arbitration.

Corporation Gas-Fitting at Goole.—Mr. Bickerton, speaking on behalf of a deputation from the Goole Tradesmen's Association, who waited on the Urban Council last week, said the members engaged in the various trades of plumbing, gas-fitting, &c., viewed with alarm the increasing manner in which the Council were encroaching upon their particular business; and he asked the Council, in fairness to them as ratepayers, to consider the injustice which they at present meted out to them in supplying gas-fittings and accessories for lighting purposes, and also by the laying of pipes inside private buildings or dwellings, which they felt was unfair competition. Asked whether the Association objected to the Council supplying cookers, Mr. Bickerton replied that they had not gone into this matter. Unfortunately, they had lost this branch of their trade irretrievably. The Chairman said the Council would consider the matter in Committee, and communicate the result to the Association.

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SEASON, 1903-4.

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Reductions in Price.—The price of gas at Darlington has been reduced by 1d. per 1000 cubic feet to ordinary consumers, and 2d. to users for power purposes. After the Christmas quarter, the price of gas at Kingston-on-Thames will be reduced to 2s. 10d. per 1000 cubic feet.

A Danger with Prepayment Meters.—On the evening of Saturday, the 21st ult., a fire occurred in a house in Lorne Buildings, Holburn Street, Aberdeen, which had a peculiar origin. A prepayment gas-meter is placed in a closet in the house. A woman putting in a coin found that it stuck, and she shook the meter to make the coin go in. Instead of accomplishing her object, she disconnected the meter from the service-pipe; and when a man went into the closet to ascertain what was wrong, the lighted candle he carried caused an explosion, which set fire to the place. The fire was easily extinguished.

Sales of Shares.—At Leeds, last Tuesday, Messrs. Hollis and Webb offered for sale by auction £3000 of new £10 shares in the Ackworth, Featherstone, Sharlston, and Purston Gas Company, bearing a maximum dividend of 7 per cent., and estimated on the present earnings of the Company to pay £5 12s. per cent. Competition was very keen; 185 shares selling at £11 per share, 60 at £11 1s., 5 at £11 2s., 10 at £10 18s. 6d., and 40 at £10 18s. Last Tuesday, at an auction sale at Southsea, some £10 shares in the Portsmouth Water Company realized £26 10s. each, and £5 shares (1879 issue), £8 15s. each.

Explosions of Gas.—Owing to the carrying out of drainage works in the vicinity, damage was done to the main of the Plymouth and Stonehouse Gas Company in Martin Street, Plymouth; and, as the result, an explosion of gas occurred last Sunday week. Flames burst from the crevices in the pavement and from some adjoining cellars; and the firemen had to be summoned to put these out, while a staff of workmen was got together with some difficulty to cut off the gas. Great inconvenience was caused to the people living in some of the houses, as they had to leave their dwellings because of the gas fumes, and in some cases were not able to occupy them during the night. An explosion of gas occurred last Tuesday at the Baths, Teignmouth. There was a smell of gas in a room which is let to a professor of music, and as its source could not be discovered, Mr. C. Mayne, the caretaker, stood on a table to examine the pendant. While there, he struck a match, with the result that an explosion occurred which set fire to the room, broke the windows in the building, and caused some injury to Mr. Mayne and two other persons. The fire was extinguished before it had made headway. It was then discovered that the leakage was due to neglect to charge the pendant with water. The Victoria Hospital for Children, in Tite Street, Chelsea, was the scene of a serious explosion of gas, followed by a small fire, on Saturday night. Five persons were injured. A quantity of gas which had accumulated in the basement of the out-patients department caught fire and exploded. The explosion occurred in the disinfecting-room, where a quantity of bedding was ignited. Four members of a family named Anderson, who were in the basement at the time, were more or less seriously burned. Some alarm was caused at Portsmouth on Saturday by an explosion which occurred at the gas-works. A shed was damaged; but, fortunately, no one was injured.

The West Ham Corporation have issued a licence to the Gas Lighting Improvement Company to store 250,000 gallons of petroleum in tanks and other structures recently completed to the satisfaction of the Inspector of Explosives.

Another fatal acetylene explosion is reported from Canada. At a Sunday school entertainment at Kippen, last week, the bursting of an acetylene apparatus caused the death of two persons, while several more were seriously injured.

Owing to recent excessive floods, several quarters of St. Petersburg were not only flooded, but plunged into darkness last week, in consequence of the supply of gas and electricity being cut off. Some of the theatres could not be opened.

The Leeds Corporation have appointed Mr. E. J. Silcock, F.S.I., as Agent for their water-works estates in the Washburn and Burn valleys. These estates comprise an area of about 15,000 acres, and it is expected will be shortly considerably increased in size.

The Cheadle Gaslight and Coke Company, has been registered with a capital of £4000 in £10 shares, as a re-incorporation under the Companies Acts, 1862-1900, of the Cheadle Gaslight and Coke Company, originally constituted by Deed of Settlement in 1842.

The Malvern Urban Council are progressing rapidly with their electric light installation, and are now laying the cables. The rapidity of the work may be judged by the fact that 3 miles of cable have been successfully laid at a depth of 18 inches, through the principal thoroughfares, in the remarkably short time of one week, including reinstating of pavements. The whole of the work has been carried out under the superintendence of Mr. H. P. Maybury.

Messrs. Stephens and Co., of Kidwelly, have lately brought out special improved silica bricks, blocks, shields, and tiles for gas-works furnaces, which are already being used by a large number of the principal gas-works in Great Britain, including the Gaslight and Coke Company, the South Metropolitan Gas Company, the West Ham Gas Company, the Bolton Gas-Works, the Devonport Gas-Works, and many others. The bricks are specially toughened for this purpose, and are exceedingly refractory.

At the meeting of the County Councils Association last Wednesday, Mr. E. J. Halsey raised the question of the Royal Commission on Sewage Disposal; and it was resolved that the President of the Local Government Board should be reminded of the correspondence on the question of water supply, and that it should be pointed out to him that the Commission had not sufficiently dealt with the matters referred to them by the President at the request of the Association, and apparently did not intend to do so. The Association therefore repeated their desire for the appointment of a Commission to consider the general question of water supplies apart from that of river pollution.

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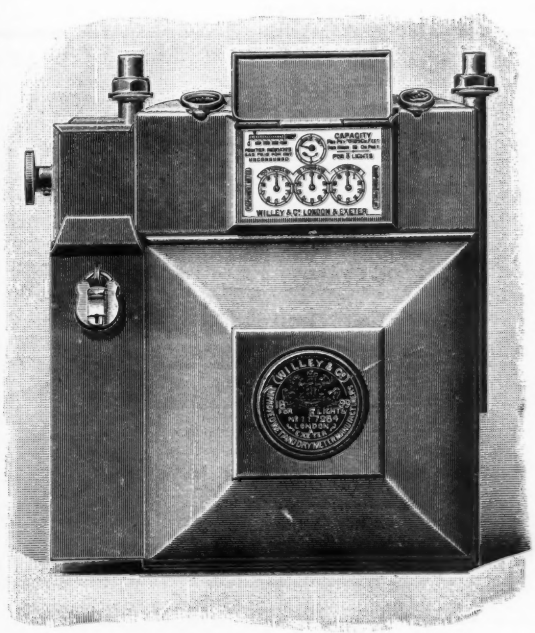

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VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers,
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PENNY-IN-THE-SLOT WORK.
H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd.,
(Eerste Hollandsche Yzererts Maaty),
ROTTERDAM.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11 Bothwell St., GLASGOW.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA
SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

AMMONIACAL Liquor wanted by JOHN RILEY & SONS, Hapton, near ACCRINGTON.

MANTLE ASHES.
THE Highest Price in the Market—35 Marks per Kilo—for above is paid by Messrs. OBERFELT AND CO., BERLIN, ENGEL UFER 1b., MANUFACTURERS OF MANTLES and Buyers of any quantity of ASHES.

COAL GAS TAR wanted.
Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE, BEST PRICE offered either on Fixed or Sliding-Scale Basis.
State Quantity to offer for Prompt and Forward Delivery.
The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.
BALE'S FIRE CEMENT, PAINT, AND GAS COAL,
5, CROOKED LANE, LONDON, E.C.

PATENTS AND TRADE MARKS
PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 248 Holborn.

TO MAKERS OF FIRE-CLAY GOODS, RETORTS, &c.
ADVERTISER, who is well-known to the Gas Profession, is in want of a good AGENCY for above, for North Midlands, including Lancashire and Yorkshire. Best of Credentials, many Years' Experience, and Business Guaranteed.
Address No. 4126, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GERMAN Gas Manufacturer desires CONNECTION with English Gas-Works Building Concern executing the building and management of Municipal Gas-Works. The advertiser is highly experienced in the concessionary line, construction, and management; and is engaged in numerous first-class enterprises. Good profits. Offers solicited.
Address B.O. 598, care of Haasenstein and Vogler, A.G., FRANKFORT-ON-THE-MAIN.

APPLICANTS for the post of General WORKING FOREMAN (No. 4123) are THANKED, and informed that the Vacancy IS NOW FILLED.

WANTED, a practical Working MANAGER for Gas-Works. Make 6 Millions. Must be thoroughly up in the Manufacture of Gas, Main and Service Laying, Fitting, &c. Wages 26s. weekly, with House, Coal, and Gas.
Apply, by letter, stating Qualifications, to No. 4129, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Foreman Stoker, used to Regenerative Settings. Eight-Hour System. Wages 30s. per week.
Apply, enclosing Testimonials, to ROBERT M. COUPER, Gas-Works, Brentwood, ESSEX.

WANTED, a competent Gas Engineer, with Experience in the Fitting up of large and small Gas Lighting Installations, to travel London and district. Must have Commercial Experience, and be a good Salesman.
Apply, by letter, giving full Particulars and Salary required, to No. 4130, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a competent Man as Gas- FITTINGS INSPECTOR. Must be experienced and have practical knowledge of the Gas-Fitting Business, and be able to superintend Gas-Fitters and Service Layers, and enter up time sheets and fitting accounts. Age from 25 to 35. Wages 32s. 6d. per week for Six Months; afterwards 35s. per week.
Applications, in own handwriting, stating Age, Experience, and present employment, and enclosing *copies* of Three recent Testimonials, to be sent not later than Dec. 12, to Mr. RALPH A. LAYTON, Secretary, GAS COMPANY, REDDITCH.

WANTED, a Gas Stoker, used to Shovel Charging, Engine and Exhauster. One who has been used to Regenerator Furnaces would have the preference. Must be tall and steady. Eight-hour shifts in Winter, Twelve hour in Summer.
Also a GAS-FITTER used to Compo. Fixing of Stoves and Meters, and Incandescent Lights. None but steady men need apply. Constant work to suitable men.
Applications, with Three recent Testimonials or Good References, to be sent to the undersigned, stating Age and Wages required.

JOHN SMITH,
Manager.

Gas-Works, Bangor,
North Wales, Nov. 28, 1903.

CORPORATION OF CLONMEL.

WANTED, by the Gas Committee of the Corporation of Clonmel, a smart, intelligent, young man, as ASSISTANT MANAGER of their Gas-Works, at a Salary of £120 per annum. None but those who have had practical experience in the Working and Management of Sulphate of Ammonia Plant need apply. A good knowledge of Chemistry and Mechanical Drawing indispensable.
Applications, endorsed "Assistant Manager," stating Age, Experience, and accompanied by *copies* only of not more than Three recent Testimonials, to be sent to Thomas Phelan, Esq., Spring Garden, Clonmel, so as to reach him not later than the 22nd of December next.
Statement of Duties and Terms of Appointment can be obtained on Application to the undersigned.

J. F. O'BRIEN,
Town Clerk.

Clonmel, Nov. 28, 1903.

FOR SALE—A 20,000 cubic feet Gas- EXHAUSTER (Makers: G. Waller and Cc.), with Valves and Bye-Pass complete. Displaced by larger Exhauster.
Apply to the CORPORATION GAS-WORKS, DONCASTER.

TO BE SOLD — Twin-Cylinder Gas- ENGINE, 6 n.h.p., by Crossley; Cylinders 8 in. diameter by 18 in. stroke, and Gas-Bag.
NEW GASHOLDER SHELLS, 40 feet diameter by 12 feet deep, and 50 feet diameter by 15 feet deep, with or without New Steel Tanks and Standard Guides.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

TO MALSTERS, CEMENT AND BRICK MANUFACTURERS, LIME BURNERS, AND OTHERS.

BEST Screened Gas Coke and Breeze FOR SALE.
Wholesale Prices can be obtained at the GAS-WORKS, SWANSEA. By Shipment or by Rail direct.

IMPORTANT TO GAS COMPANIES AND GAS ENGINEERS.

FOR Immediate Disposal, to clear Stock—all, or a portion.
2000 2-inch GAS BENDS.
3000 2-inch GAS PIECES—3 in. to 11½ in.
2000 2-inch GAS LONG SCREWS—3 in. to 11½ in.
All New Stock. Best Quality.
Apply to "STOCKS," care of Messrs. Deacon's, LEADENHALL STREET, E.C.

TO BE SOLD Cheap:—
Two (18 inch) SQUARE STATION METERS, new drums.
TOWER SCRUBBERS from 3 ft. 6 in. up to 12 feet diameter, in pairs or singly.
Patent WASHERS, 8-inch, 10-inch, and 12-inch, by "Holmes," "Kirkham," "Walker," and "Livesey."
EXHAUSTERS, patent type, from 2000 to 100,000 cubic feet per hour.
CONDENSERS, RETORT IRONWORK, GAS-HOLDERS, STEEL TANKS.
Every description of New and Second-Hand Gas Plant made and supplied.
Inquiries solicited by J. FIRTH BLAKELEY and Co., Thornhill, DEWSBURY.

1500 Feet Cowan Station Meter, with 4-inch Connections and Bye-Pass Valves, in Good Working Order, FOR SALE.
SHEPSHED GAS-WORKS, LEICESTERSHIRE.

TAR Contracts Wanted on the Sliding- Scale or at Fixed Prices.
Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

THE Hyde Gas Company are prepared to receive TENDERS for LOANS to the amount of £3500 to be secured by Mortgage.
Offers, stating amount, with term of Years and rate per cent. Interest, to be addressed to the Chairman of the Company, Raglan Street, Hyde, and marked "Loan."

G. J. WESTBROOK,
Clerk and Solicitor to the Company.

Clarendon Place, Hyde,
Nov. 4, 1903.

MANCHESTER CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply and delivery of the FIRE-CLAY GOODS required during next season at their several Gas-Works.
Full Particulars and Forms of Tender may be obtained from Mr. C. Nickson, Superintendent, at the Gas Offices, Town Hall, Manchester, on payment of a deposit of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender.
Sealed Tenders, endorsed "Tender for Fire-Clay Goods," addressed to the Chairman of the Gas Committee, Town Hall, Manchester, are to be delivered at the Gas Offices, Town Hall, not later than Ten a.m. on Monday, the 14th of December, 1903.

By order,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Nov. 27, 1903.

CORPORATION OF NOTTINGHAM.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the supply of the whole, or a portion, of their requirements of the following GOODS and MATERIALS, for delivery during the ensuing Year, carriage paid, at their various Gas Stations, Chemical Works, or Stores, or at any Railway Stations within the Nottingham Gas-Supply District.

A.—Cast-Iron Pipes and Specials.
B.—Pig Lead, Lead and Compo. Pipe, White, Red, and Chemical Sheet Lead.
C.—Wrought Iron and Steel.
D.—Retorts and Fire Materials.
E.—Meters—Wet, Dry, and Prepayments; also Repairs.
F.—Wrought-Iron Tubes and Fittings.
G.—Brass Cocks and Malleable Iron Levers.
H.—Small Iron Castings, Retort-Fittings, &c.
I.—Purchase of Old Cast and Wrought Scrap Iron, old Copper, Brass, &c.
J.—Lime for Purification and Chemical Works Purposes.
K.—Paints.
L.—Oils.
M.—Rope Yarn.
N.—Tallow.
O.—Cotton Waste.
P.—Coke Forks, Shovels, Buckets, Files, &c.
Q.—Meter Boxes, Platforms, and Shelves.

Specifications and Forms of Tender may be obtained, and Samples seen, on application to the Engineer and General Manager, at the Gas Offices, George Street, Nottingham.
Tenders to be addressed to Sir Samuel George Johnson, Kt., Town Clerk, and to be delivered at the Guildhall, Nottingham, not later than 9.30 a.m. on Monday, the 14th day of December.
The Gas Committee do not bind themselves to accept the lowest or any Tender.

By order,
JAMES HERBERT BROWN,
Engineer and General Manager.

Nov. 28, 1903.

KENT WATER-WORKS COMPANY.

SALE BY TENDER OF THREE PER CENT.

DEBENTURE STOCK.

THE Directors invite Tenders for such amount of THREE PER CENT. DEBENTURE STOCK, or of any portion thereof, being a multiple of £10, as may in the whole be sufficient to realize the sum of £74,147 6s. 7d., being the balance of the Capital authorized to be raised under the provisions of the Kent Water-Works Act, 1902.
This Stock may be redeemed at par by the Company at any time after the expiration of 25 Years from the date of issue upon Six Months previous notice to the registered holders thereof. It ranks *pari passu* with the other Debenture Stocks of the Company for the payment of interest.
The Ordinary Capital of the Company raised is £868,000, which comprises £708,000 Capital Stock, on which a dividend of 10 per cent. per annum was paid on the Half Year to Midsummer, 1903, and £160,000 new Capital Stock, on which the full dividend of 7 per cent. has been paid since its issue.
The Loan Capital raised is £273,512—viz., £42,000 by Mortgages, and £231,512 by Debenture Stock.
This Stock is an authorized investment for Trustees.
Forms of Tender, with Particulars and Conditions, may be obtained on application to the Secretary.
Tenders to be sent in on or before Tuesday, the 15th of December.

By order of the Directors,
A. DICKSON, jun.,
Secretary of the Company.

Kent Water-Works Offices:
Mill Lane, Deptford, S.E., Nov. 14, 1903.

SHOTLEY BRIDGE AND CONSETT DISTRICT GAS COMPANY.

TENDERS FOR TAR.

THE Directors of this Company invite TENDERS for the purchase of the TAR to be produced at their Works during the Year 1904. Quantity, about 70,000 Gallons.
The Contractor to find his own Casks and to accept delivery at Blackhill Station.
Tenders to be sent not later than Wednesday, Dec. 9.

M. RICHLEY,
Secretary.

Shotley Bridge, Nov. 21, 1903.

BRIDGEWATER COLLIERIES COKE-WORKS.

(THE EARL OF ELLESMERE).

TENDERS are invited for the Tar produced at the above Works for a period of Six or Twelve Months from the 1st of January, 1904, delivered into contractor's tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway; or at the Brackley siding on the Little Hulton Mineral Branch of the London and North-Western Railway.
The estimated quantity is 2500 Tons per annum.
Tenders, endorsed "Tender for Tar," to be addressed to Mr. THOMAS M. BROWN, Bridgewater Coal Office, 4, Chapel Walks, Manchester, on or before the 7th of December.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

TO RAILWAY RAIL CONTRACTORS.

THE Commissioners are prepared to receive TENDERS for the supply of from 250 to 300 Tons of New Double-Headed STEEL RAILS, weighing 75 lbs. per lineal yard, in lengths of from 24 to 30 feet, delivered at their Railway Sidings, New Gas-Works, Granton, near Edinburgh (Caledonian or North British Railway Systems), or free on rail at Leith or Granton Harbours.
Deliveries to be commenced immediately after acceptance of Offer, and to extend over a period of Three Months.
Full Particulars and Section of Rail can be obtained upon application to Mr. W. R. Herring, M.Inst.C.E., Chief Engineer and Manager, New Street Works, Edinburgh.
Tenders to be lodged with the Undersigned on or before Monday, the 14th day of December, 1903, not later than Ten a.m., sealed and endorsed "Tender for Railway Rails."
The Commissioners do not bind themselves to accept the lowest or any Offer, and reserve to themselves the right of accepting the whole or a portion of the material tendered for.

JAMES M'G. JACK,
Clerk.

25, Waterloo Place, Edinburgh,
Nov. 16, 1903.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

THE Commissioners are prepared to receive TENDERS for the supply of 4000 to 5000 Tons of Best Quality Fine Ground Medium Quick-Setting PORTLAND CEMENT, delivered in Bags *ex.* ship into Railway Waggons, Granton Harbour, or on rail at the Sidings, New Gas-Works, Granton, near Edinburgh (Caledonian or North British Railway Systems.)
Deliveries to commence in the beginning of 1904 and extend over a period of about Three Years in quantities of from 200 to 300 Tons.
Full Particulars can be obtained on application to Mr. W. R. Herring, M.Inst.C.E., Chief Engineer and Manager, New Street Works, Edinburgh.
Tenders to be lodged with the undersigned on or before Monday, the 14th day of December, 1903, not later than Ten a.m., sealed and endorsed "Tender for Portland Cement."
The Commissioners do not bind themselves to accept the lowest or any Offer, and reserve to themselves the right of accepting the whole or a portion of the material tendered for.

JAMES M'G. JACK,
Clerk.

25, Waterloo Place, Edinburgh,
Nov. 16, 1903.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Corporation of Birkenhead invite OFFERS for the Purchase and Removal of the AMMONIACAL LIQUOR produced at the Gas-Works, for a period of One, Three, or Five Years from the 1st of July, 1904.
Deliveries to be taken either by Boat or Rail to the mutual convenience of the Corporation and the Contractor; but the latter will be required to provide Boats or Railway Tank-Waggons—the Corporation providing appliances for filling same.
The Contractor whose Tender is accepted will be required to enter into a formal Contract or Agreement with the Corporation, upon the specific terms and conditions contained in the draft contract which has been prepared by the Town Clerk, and deposited in his Office for inspection, and containing a clause as to the payment of the rate of wages, and the observance of the hours of labour recognized and agreed upon between the Trades' Unions and the Employers in the locality in which the work for carrying out the contract is to be performed.
Forms of Tender, and further Particulars, may be obtained from Mr. T. O. Paterson, C.E., Gas Engineer, at the Gas-Works, Thomas Street.
Tenders, sealed and endorsed "Tender for Ammoniacal Liquor," to be sent in to me not later than Five p.m. on Thursday, the 3rd of December, 1903.
The Corporation do not bind themselves to accept the highest or any Tender.

By order,
ALFRED GILL,
Town Clerk.

Town Hall, Birkenhead,
Nov. 20, 1903.

SHIPLEY URBAN DISTRICT COUNCIL.

THE Council are prepared to receive TENDERS, from experienced Contractors, for the following :—

CONTRACT No. 4—MASONRY of an Inclined Retort-House.

CONTRACT No. 5—IRONWORK of Roof and Retort-Stack Mountings, Coal Elevating and Charging Plant.

CONTRACT No. 6—FIRE-CLAY WORK and MATERIALS of an Inclined Retort-Stack, Settings, and Chimneys.

The Specification and Drawings may be seen on application to Mr. T. G. Wilcock, Manager, Gas-Works, Shipley, and at the Office of Messrs T. Newbigging and Son, Engineers, 5, Norfolk Street, Manchester.

Copies of the Bill of Quantities may be obtained from the latter on payment of Three Guineas, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Gas-Works Extension," to be sent to the undersigned not later than Monday, the 15th of December, 1903.

The Council do not bind themselves to accept the lowest or any Tender.

ISAAC LINDOW,
Clerk of the Council.

Manor House, Shipley,
November, 1903.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to DEBENTURE STOCK and BONDS, WILL BE CLOSED at Four o'clock p.m. on Thursday, the 10th prox., for the Half Year ending on the 31st prox., and WILL BE RE-OPENED on the morning of Friday, the 11th prox.

The Interest for the Half Year will be payable on the 1st of January next to the Proprietors registered on the closing of the Books.

By order,
HENRY RAYNER,
Secretary.

Chief Office: Horseferry Road,
Westminster, S.W., Nov 28, 1903.

NORTH MIDDLESEX GAS COMPANY.

SALE BY TENDER OF
£3000 FIVE PER CENT. PREFERENCE STOCK
AND 300 SEVEN PER CENT. ADDITIONAL
ORDINARY SHARES OF £10 EACH.

NOTICE is Hereby Given, that the Directors of the North Middlesex Gas Company will offer the above Stock and Shares for SALE BY TENDER during the ensuing period ending the 29th of December, 1903, the last day for the reception of Tenders being Tuesday, the 29th of December, 1903.

Particulars of the Sale and Forms of Tender may be had on Application to the undersigned, or at the District Office of the Company, No. 11, The Broadway, Church End, Finchley.

By order,
ERNEST L. BURTON,
Secretary.

Secretary's Office:
5 & 6, Great Winchester Street,
Old Broad Street, London, E.C.
Nov. 27, 1903.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF 300 £10 "C" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 8, at Two o'clock precisely, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £4570 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 8, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

BARKING GAS COMPANY.

72 £10 ORDINARY 7 PER CENT. SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Dec. 8, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

CASES FOR BINDING

QUARTERLY

VOLUMES OF THE "JOURNAL"

(GREEN CLOTH, GILT LETTERED)

A 4pp. 8vo. Leaflet. Price, 10s. 6d. per 100.

"Agricultural Value of Gas Lime."

A Paper read by Mr. CHARLES D. PHILLIPS, J.P., a Director of the Newport Gas Company, before the Monmouthshire Chamber of Agriculture.

Reprinted from the "JOURNAL" for Oct. 13, 1903.

WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

ARMSTRONG'S
PATENT
CANDLE SAFETY LAMPS.

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7 or 9 hours.

48, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

HEATHCOTE GAS COAL.

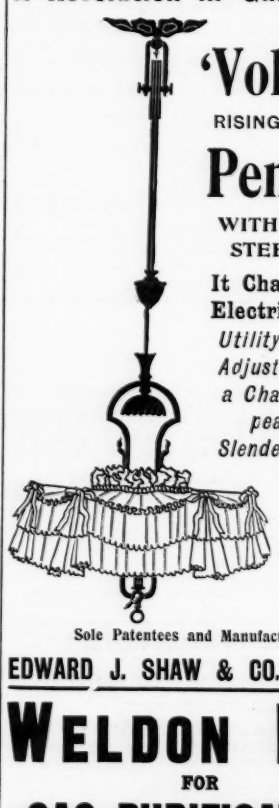
Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

A Revolution in Gas-Fittings



IS THE
'Volonta'
RISING & FALLING
Pendant
WITH FLEXIBLE STEEL TUBES.

It Challenges the Electric Light for *Utility, Novelty, & Adjustability, and a Charming Appearance of Slender Elegance.*

Patented in many Countries.

Sole Patentees and Manufacturers:
EDWARD J. SHAW & CO., WALSALL.

WELDON MUD
FOR
GAS PURIFICATION,

For use in the
RECOVERY OF SULPHUR,
Also Removal of last Traces of
SULPHURETTED HYDROGEN
in catch position.

Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— LIMITED, —
1, FENCHURCH AVENUE, LONDON, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to **Mr. EDWARD PRICE,** "Langley," Wyke Avenue, **WORTHING.**

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

UNEQUALLED.

Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMP^Y
RAVENSTHORPE, NEAR DEWSBURY.

THE PERFECT MANTLE CO^Y.
1c, Aldgate Avenue, London, E.C.

MANUFACTURERS OF THE WELL-KNOWN
SUPERIOR "PERMCO"
MANTLE, IN COTTON AND RAMIE.

Under Welsbach Licence. Can be used legally with any Burner.

Trade Price 26s. 6d. per Gross.
Reduction for Quantities.

THE
"ROTARY"
STATION METER.

Efficiency
Demonstrated.

APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE,
MANCHESTER.

TROTTER, HAINES, & CORBETT, LIMITED,

Brettell's Estate

FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS-RETORTS GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

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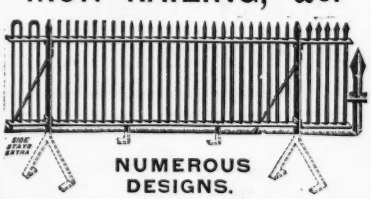

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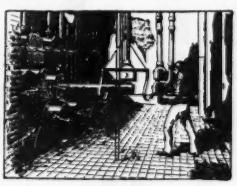

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Fitted with Steel Reflector.

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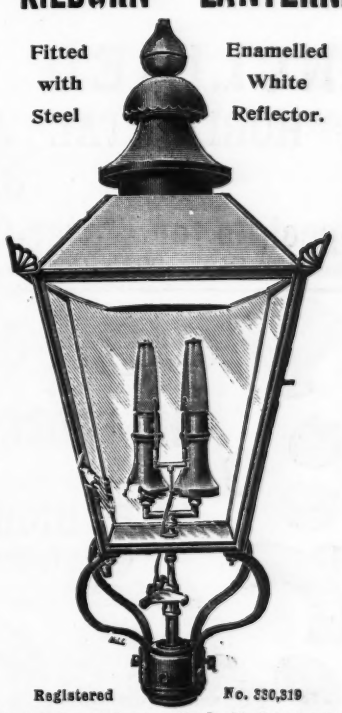

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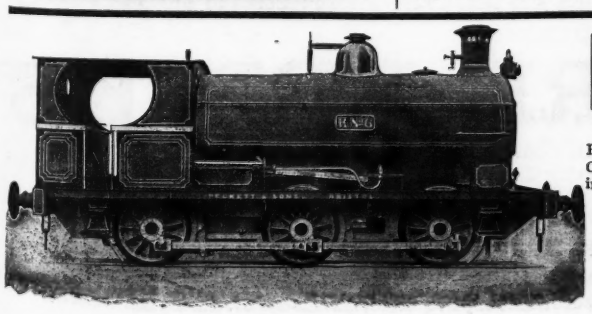

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A very powerful Fire, specially suitable for SITTING-ROOMS, OFFICES, &c.

23½ inches high by 20 inches wide.
Fire Space, 10 inches wide.

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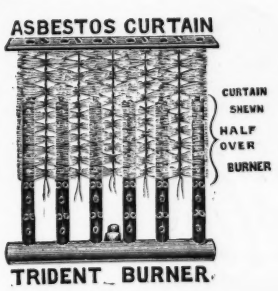

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This cut has been prepared to show the construction of the TRIDENT BURNER, and the method by which it is covered with the Asbestos Curtain which produces the unique incandescent effect immediately the gas is lighted.

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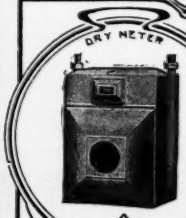

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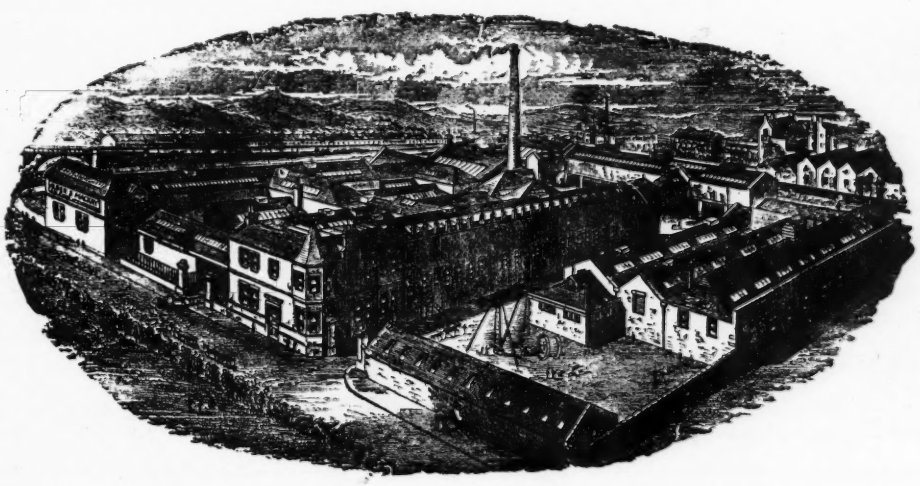

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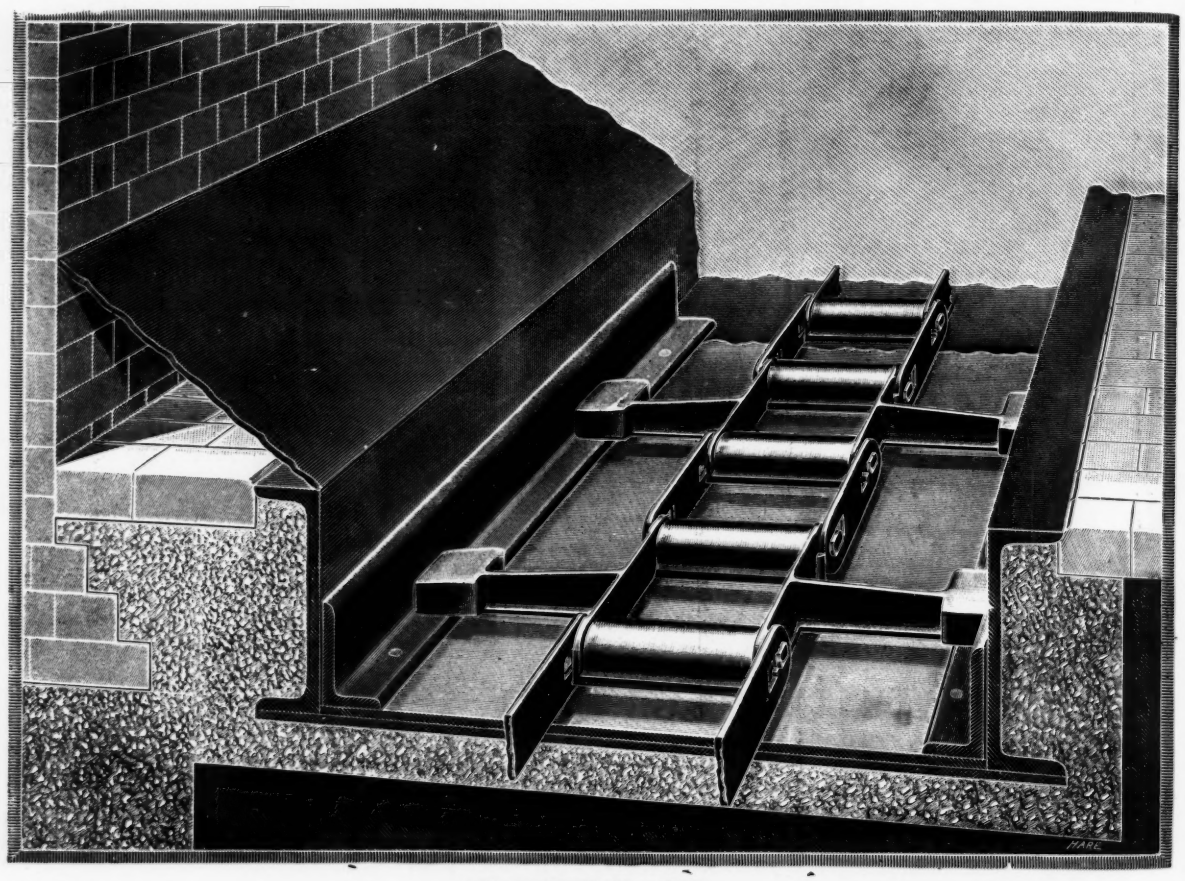

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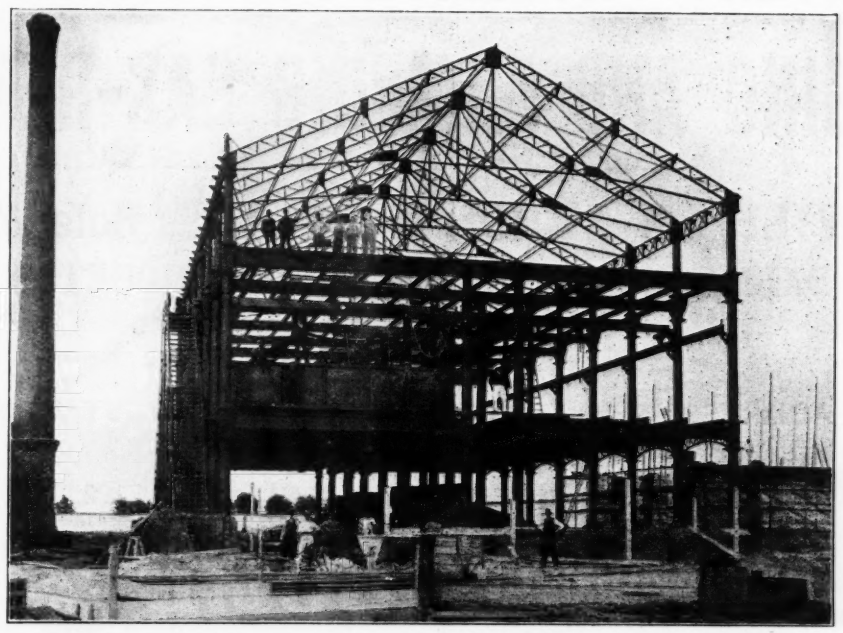

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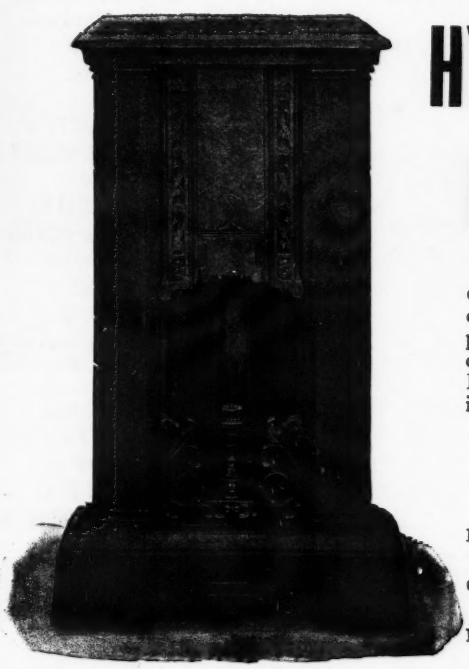

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Fine Cast and Blacked	£3 3 0
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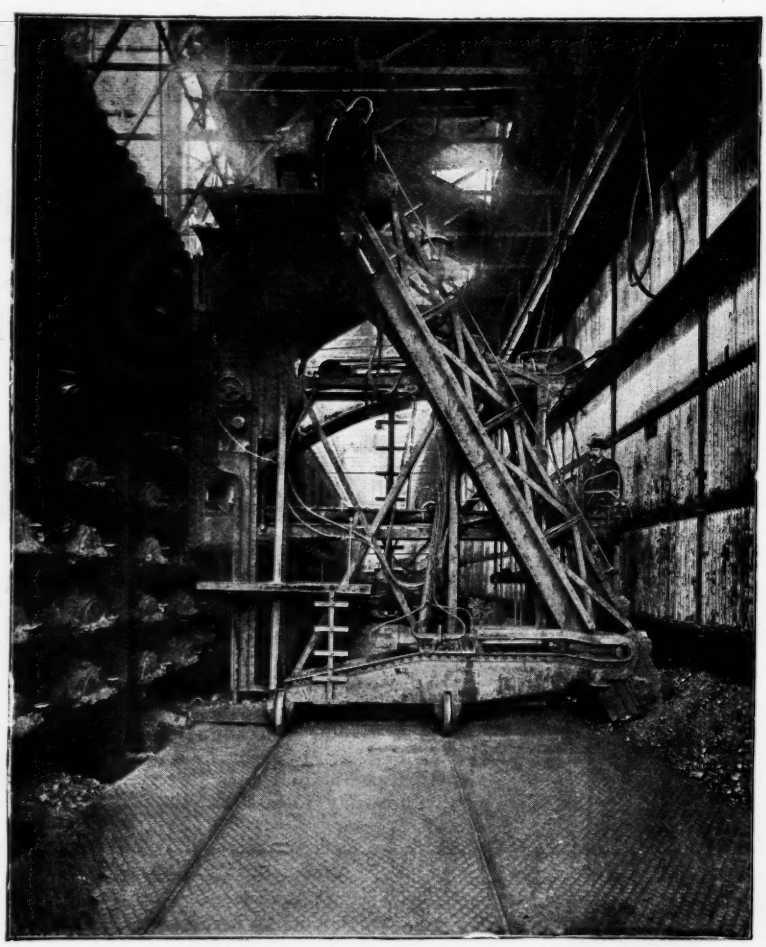

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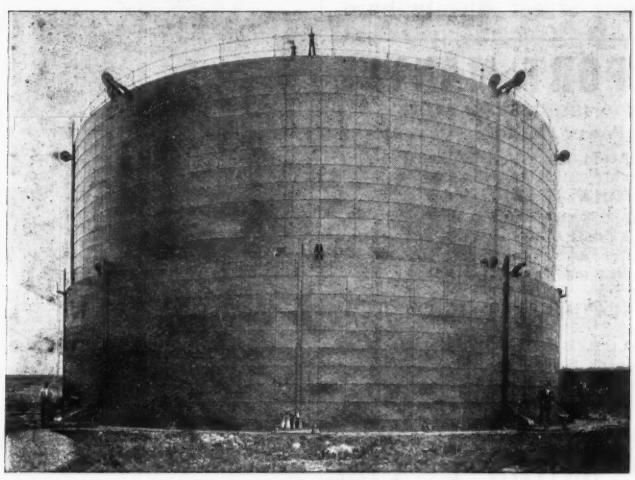

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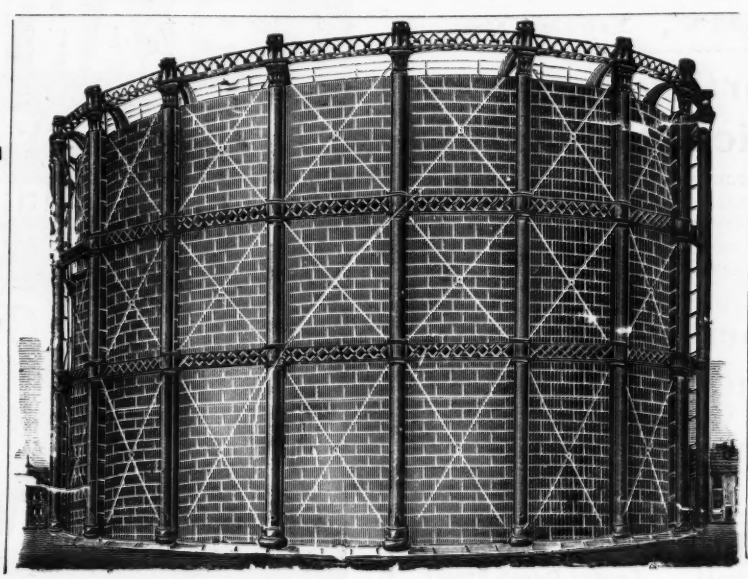

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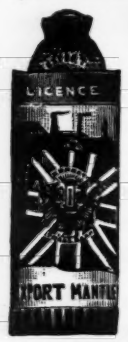

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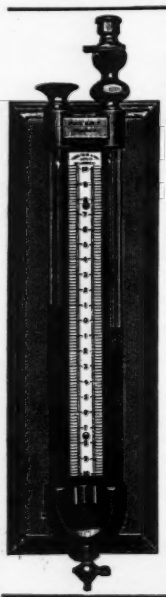

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FOR Arches and Crowns where high heats are required. They contain over 90 per cent. of Silica, and are nearly stationary under the influence of heat, swelling a little rather than contracting. They are not like a Gannister or Dinas Brick, but a Fire-Brick of a highly Silicious nature.

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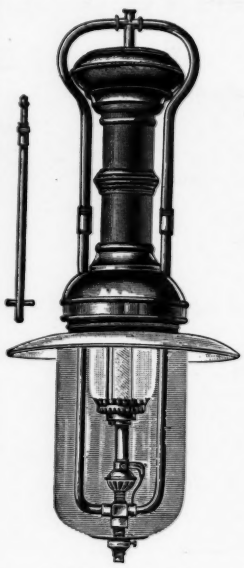

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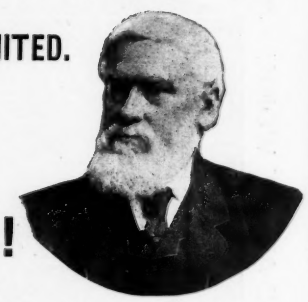
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Silver Medal,

PARIS, 1867.

The only Medal,

VIENNA, 1873.

Silver Medal,

MANCHESTER, 1875.

LONDON, 1862.

CLASS X.

THE MEDAL FOR INGENUITY COMPLETENESS & EFFICIENCY OF APPARATUS FOR MEASURING GAS & EXCELLENCE OF MATERIAL AND WORKMANSHIP.

First Award,

SYDNEY, 1879.

First Class Award,

GLASGOW, 1880.

Gold Medal,

MELBOURNE, 1880.

LONDON, 1862.

CLASS XXXI.

THE MEDAL FOR SUPERIOR CONSTRUCTION AND SOUND WORKMANSHIP.

Gold Medal,

NEW ZEALAND, 1882.

Gold Medal,

LONDON, 1884.

Gold Medal,

LONDON, 1885.

Gold Medal,

LIVERPOOL, 1886.

First Order of Merit,

MELBOURNE, 1888.

First Order of Merit,

ADELAIDE, 1887.

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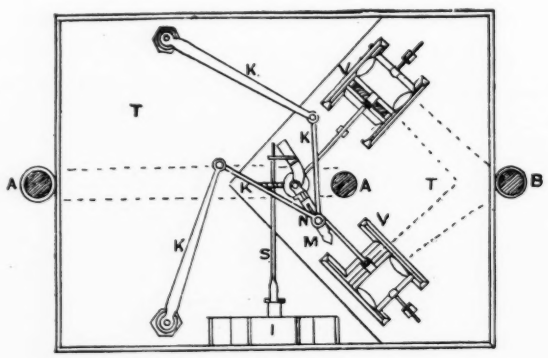

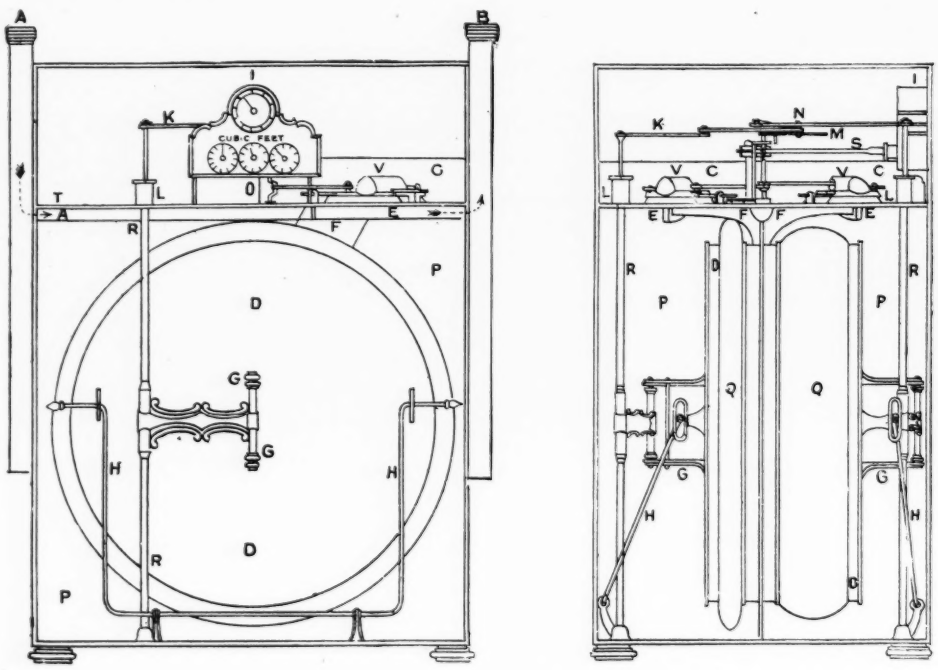

DRY GAS METER.

A. Inlet.
B. Outlet.
C. Valve Chamber.
D. D. Discs.
E. E. Outlet pipes from centre "ports" of valves.
F. F. Pipes connected with interior chambers.
G. G. T-pieces connecting discs with driving rods.
H. H. Guides to preserve parallel motion of discs.
I. Index.
K. K. Arms connecting driving rods with cranks.
L. L. Stuffing boxes, to prevent escape of gas round the rods, from the measuring chambers.
M. Slotted "tangent" of crank.
N. Pin in slot of "tangent" to regulate the travel of the discs.
O. Crank for opening and closing valves.
P. P. Exterior measuring chambers.
Q. Q. Interior ditto.
R. R. Driving Rods.
S. Wheel and spindle communicating the revolutions of the crank to the index.
T. Valve plate.
V. V. Valves for admitting the gas alternately to the interior and exterior measuring chambers.

RANELAGH WORKS,
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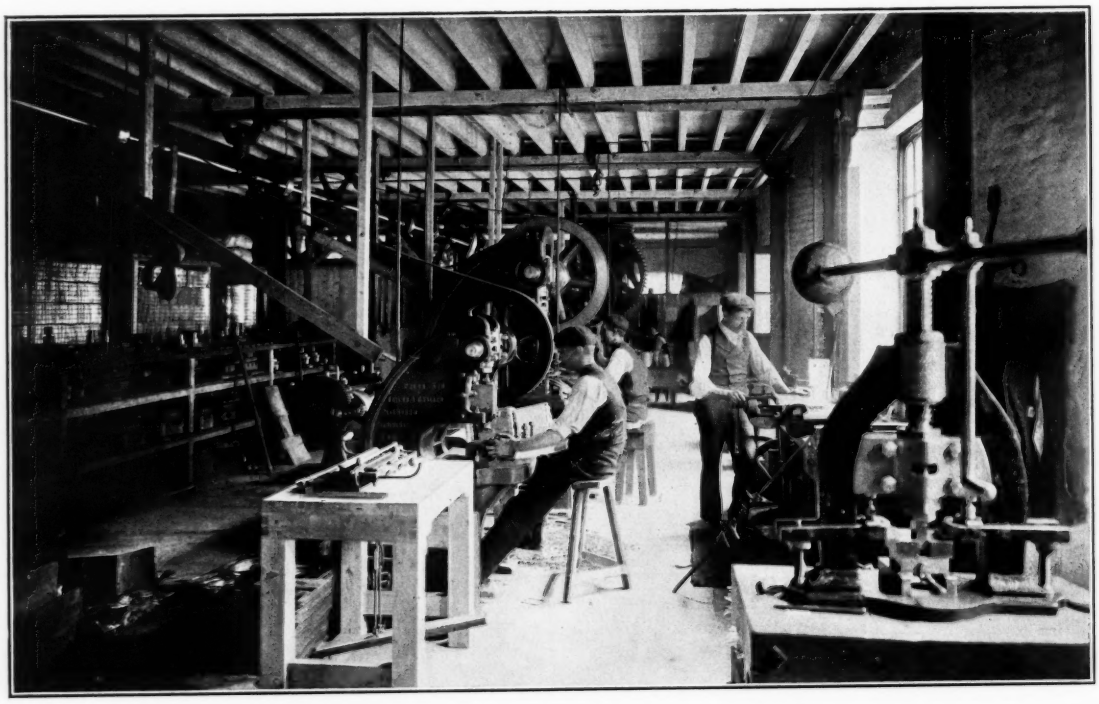
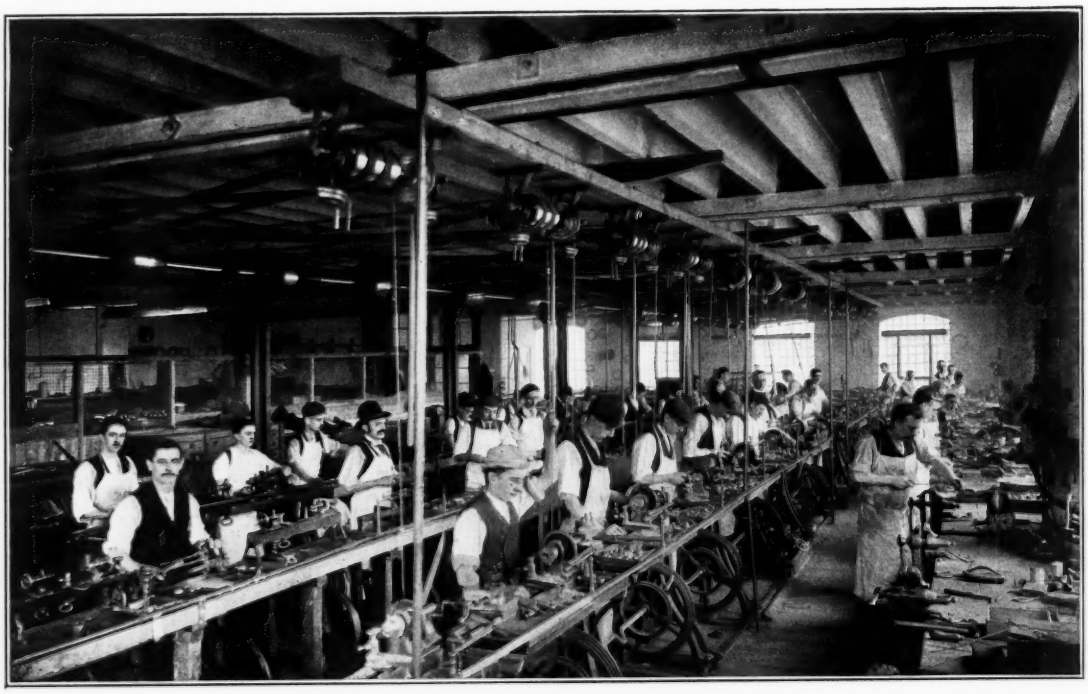
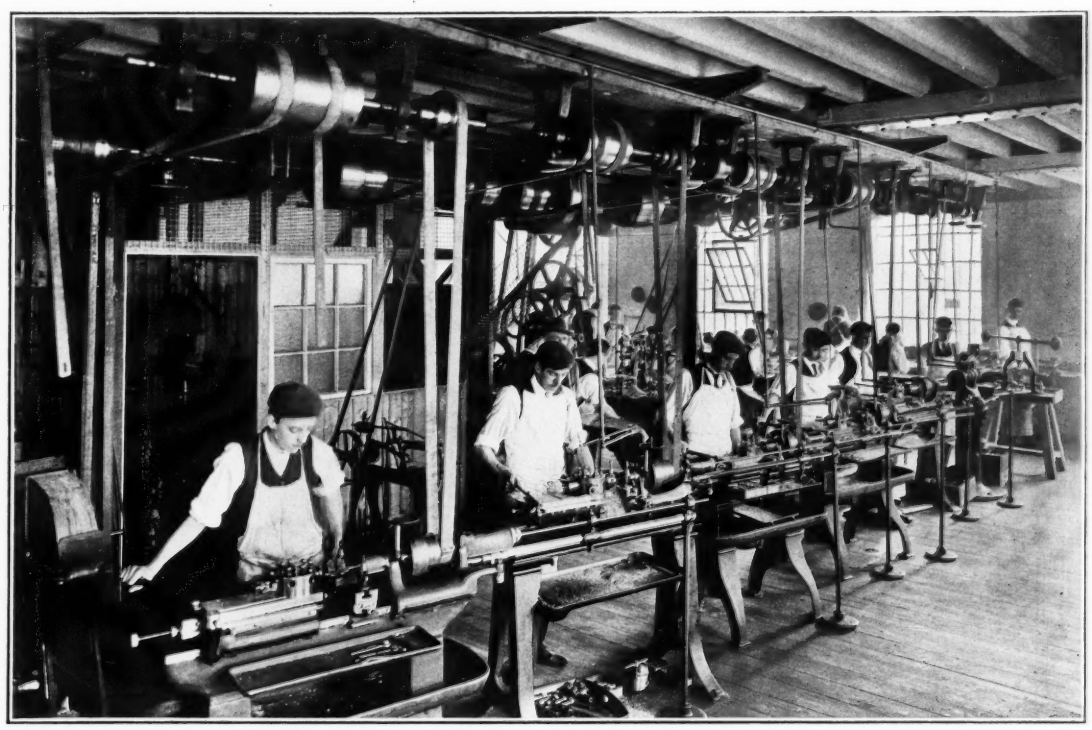
Messrs. George Glover & Co., Ltd., have much pleasure in inviting Engineers and Managers of Gas-Works to inspect the recent additions to their Works at Chelsea, which are now in full operation . . . . . .



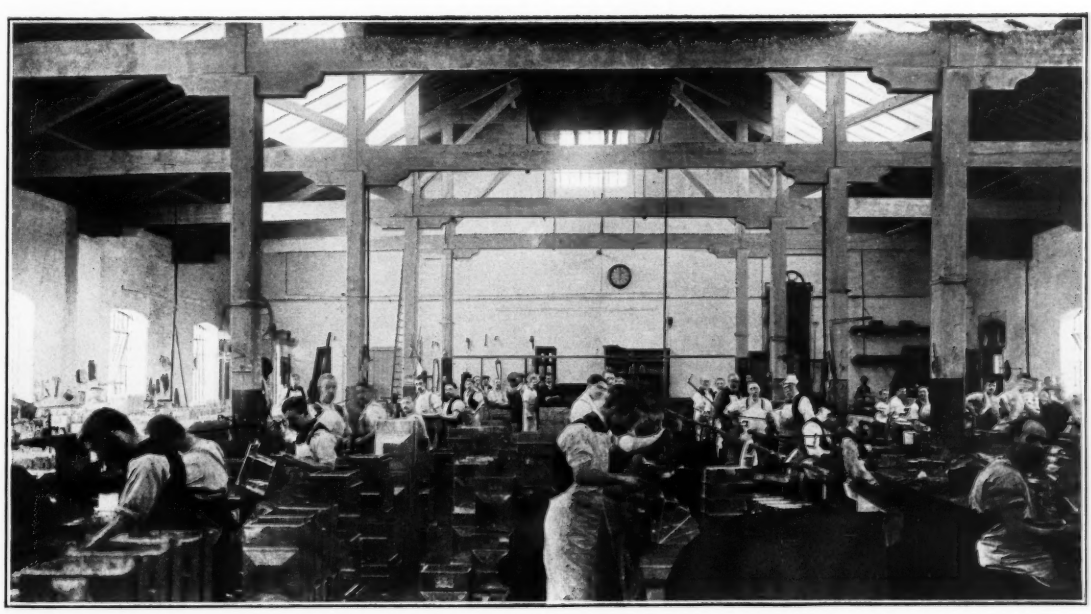
NEW STAMPING DEPARTMENT.



NEW BRASS SHOP.



NEW AUTOMATIC SHOP.



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NEW TIN SHOP.—"FINISHERS."

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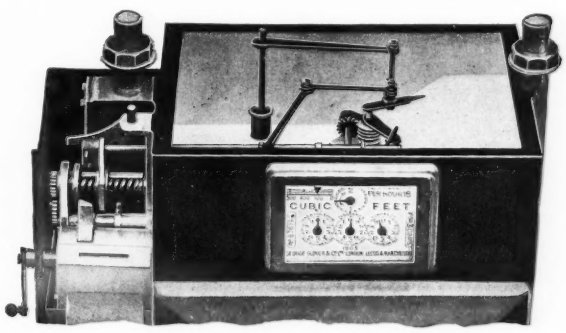
GEORGE GLOVER & CO., LTD.

PREPAYMENT METER.

FOR PENNIES



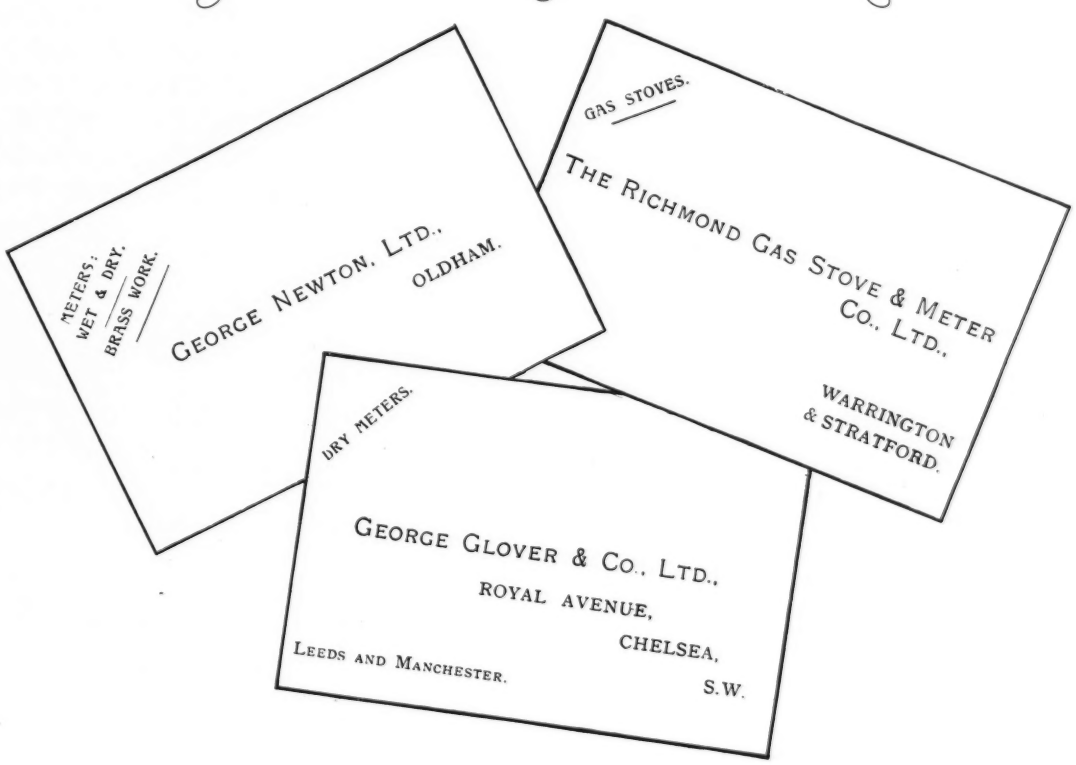
OR SHILLINGS.

THIS Meter is an adaptation of our well-known Dry Gas Meter.

The prepayment mechanism contains no spring and has comparatively few parts. These are very substantial, work smoothly, and with a minimum of friction.

The Valve and prepayment mechanism are outside the ordinary meter case so that they can be got at for examination and lubrication at any time without opening the meter itself.

When necessary to alter the price of gas, this can be readily done *in situ* by the use of a small change wheel.



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TOGETHER WITH GASHOLDER PREPARED FOR TELESCOPING.

WE RECEIVED THE ORDER FROM THE CASTLE DOUGLAS GAS COMPANY FOR THE ABOVE GASHOLDER, COMPLETE WITH FOUNDATIONS **Aug. 22, 1903.**

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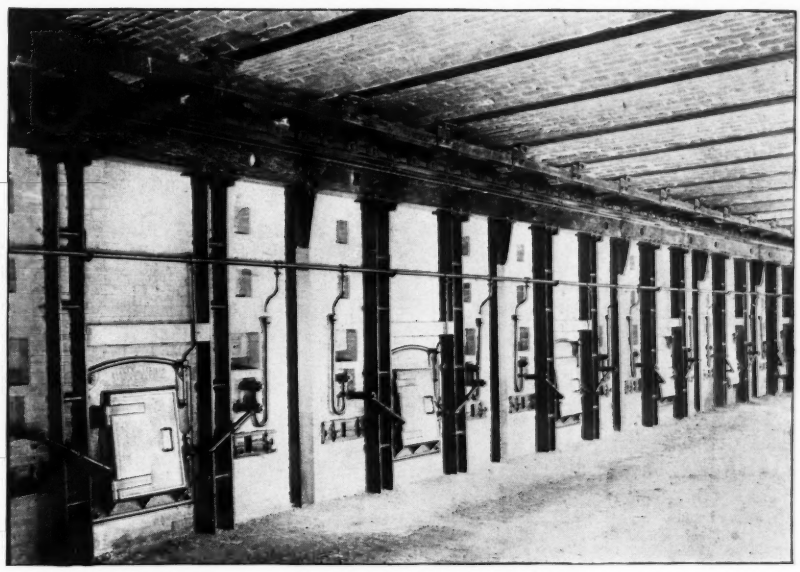

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MALTON
MARGATE
MARLBOROUGH
MARKET HARBOROUGH
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MORECAMBE
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